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Bulletin of the Entomological Society of America

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VOLUME 5 NUMBER 1

MARCH, 1959

Published by the
ENTOMOLOGICAL SOCIETY OF AMERICA

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BULLETIN
of the
ENTOMOLOGICAL SOCIETY OF AMERICA
Published by
ENTOMOLOGICAL SOCIETY OF AMERICA
F. W. Poos, Managing Editor
R. H. Nelson, Editor
1530 P Street, N. W., Washington 5, D. C.
ADams 4-1110

Issued quarterly on the 15th of March, June, September and December, in the interest of professional entomology.

Terms of subscription: Non-member $5.00 per year payable in advance. Single copies $1.25. Address all inquiries to the Society at the address given above.

Second-class mail privileges authorized at Washington, D. C. Additional entry at Baltimore, Md.

Printed by The Horn-Shafer Co.
Baltimore, Md., U.S.A.

SUSTAINING ASSOCIATES

Representatives from two of our Sustaining Associate firms had exhibits at the December 1–4, 1958 meeting in Salt Lake City, Utah. These exhibitors were

CALIFORNIA SPRAY CHEMICAL CORPORATION

SHELL CHEMICAL CORPORATION

As this is written, the 1959 SUSTAINING ASSOCIATE renewals are coming into this office. An additional list will be printed in the June BULLETIN. Those received prior to press time were as follows:

COLLOIDAL PRODUCTS CORPORATION
100 Gate 5 Road
Sausalito, California
1956–1960

E. I. DUPONT DE NEMOURS COMPANY, INC.
Grasselli Chemicals Department
Wilmington 98, Delaware
1955–1959

GEIGY AGRICULTURAL CHEMICALS
Division of Geigy Chemical Corporation
Saw Mill River Road
Ardsley, New York
1959

GENERAL CHEMICAL DIVISION
Allied Chemical & Dye Corporation
40 Rector Street
New York 6, New York
1955–1959

MONSANTO CHEMICAL COMPANY
800 North Lindbergh Blvd.
St. Louis 66, Missour
1956–1959

PENNSYLVANIA FARM BUREAU COOPERATIVE ASSOC.
3609 Derry Street
Harrisburg, Pennsylvania
1955–1959

ROHM & HAAS COMPANY
222 W. Washington Square
Philadelphia 5, Pennsylvania
1955–1959

SHELL CHEMICAL CORPORATION
Agricultural Chemical Sales Division
460 Park Avenue
New York 22, NewYork
1955–1959

STAUFFER CHEMICAL COMPANY
380 Madison Avenue
New York 17, NewYork
1955–1959

SWIFT & COMPANY
Agricultural Chemical Division
Chicago 9, Illinois
1958–1959

UNITED FRUIT COMPANY
80 Federal Street
Boston, Massachusetts
1955–1959

VELSICOL CHEMICAL CORPORATION
330 East Grant Avenue
Chicago 11, Illinois
1955–1959

WISCONSIN ALUMNI RESEARCH FOUNDATION
506 North Walnut Street
Madison 5, Wisconsin
1958–1959

WOOLFOLK CHEMICAL WORKS, LTD.
Ft. Valley, Georgia
1956–1959

AUTOGRAPHA 0 0

MANAGING EDITOR. By action of the Governing Board at the Salt Lake City meeting the Society now has a Managing Editor for all the Society's publications. As you will note by the BULLETIN masthead, this position has been accepted by Fred W. Poos. We know of no one in the Society with better background, ability or interest for the job than Dr. Poos. He will also continue as subject editor of the JOURNAL OF ECONOMIC ENTOMOLOGY. The Executive Secretary is, by constitutional provision, the subject editor of the BULLETIN. Elsewhere in this issue you will find some comments by the Managing Editor. We hope this will appear in each issue of the BULLETIN. The Society address and telephone number as given in the masthead will serve for reaching the editors.

EX POST FACTO. The Greeks had a word for it—and so did the Romans. Not knowing the former, we have used the latter. In the December 1956 BULLETIN we printed the article, *Speculation and Research* by Raymond C. Osburn. We intended—how well we pave the road to Charon's landing—to make some comment on the article in the December AUTOGRAPHA 0 0. It was not done. May we now thank our friend Russ Whitten for supplying the manuscript. The writer had the privilege of knowing Dr. R. C. as a teacher and a friend. His calm philosophy would help many of us today. We note with appreciation the reprinting of excerpts from this article in the February 1959 *Entomology Division Newsletter*, Canadian Department of Agriculture.

SALT LAKE CITY MEETING. This was another real good meeting—to use the vernacular. All the committee members concerned with the various parts of the meeting did their part in an exemplary manner. We hope each member of the Society will take time to read the various reports on the meeting as contained in this issue of the BULLETIN.

BACK ISSUES. Do you have a complete Volume 1 of the JOURNAL OF ECONOMIC ENTOMOLOGY? Or Volumes 7, 8, 11, or 12? If so, and you wish to sell them or your set of the JOURNAL containing these volumes, please write the Washington office. Back numbers of either the ANNALS or the JOURNAL contributed to the Society may be claimed at 50 cents per number or $3.00 per volume on your Federal income tax as a contribution to a non-profit scientific society.

DETROIT MEETING. We wish to emphasize at every opportunity that this year we are having a joint meeting with our sister Canadian Society and we want it to be a

(*Continued on page 15*)

Strength Through Union

A MESSAGE FROM THE PRESIDENT

By P. W. OMAN

EFFECTIVE January 1, 1959, the Entomological Society of America became a member of the American Institute of Biological Sciences. An overwhelming majority of our members who voted on the issue last year favored the proposal that the Society join the AIBS. This decision promises to be a momentous one for both organizations. For entomologists, it represents long-overdue recognition of our responsibilities to the biological science fraternity, and the advantages of joining with related professions in seeking solutions of common problems. For the AIBS the membership of our Society constitutes a major step in the effort to build an organization truly representative of the biological sciences in the United States.

P. W. OMAN

The reasons for seeking membership in the AIBS were cogently stated in two articles in the Bulletin of the Engomological Society of America[1] last year. Now that we have taken this important step, it seems appropriate to consider the pattern of relationship that should exist between these two organizations. Clearly, this will be determined largely by our own decisions and actions. We can, if we choose, remain relatively aloof. However, in voting to join the AIBS, I believe our membership was voicing its desire that we participate wholeheartedly in a national effort to advance the science of biology and the interests of biologists. To that end we should take advantage of any and all opportunities to strengthen the ties that now unite these two organizations. A passive attitude in this relationship will accomplish nothing; individually and as an organization we must seek ways whereby this union will be a fruitful one.

A brief scrutiny of some of the problems currently confronting our Society reveals a number of matters of possible concern also to the AIBS. It will be recalled that our *Committee on Professional Training, Standards and Status* is engaged in surveying educational institutions offering courses and granting degrees in entomology. The AIBS has projected a thorough study of biological curricula in high schools and first year college. This study by the AIBS, so essential on a long-term basis to an interpretation of the results of our own surveys, could not be accomplished by our Society. The two studies together should present a revealing picture of the pattern of academic training available for entomologists, and provide a sound basis for any needed modifications.

Our Committee has also been concerned, quite properly, with the inadequacy of the present U. S. Civil Service specifications for entomologists in Federal service. About a year ago we approached the U. S. Civil Service Commission with a proposal that the Society be permitted to cooperate with the Commission in rewriting the "Entomology Series" of specifications, with the particular objective of obtaining more representative coverage of the many areas of specialization embraced by entomology. In replying to our overtures, the Commission in essence took the position that certain basic principles common to several related scientific disciplines would have to be worked out before specifications for entomologists would receive attention. It therefore seems clear that progress in this matter will require solid support by the AIBS, if not the actual leadership of that organization in a concerted effort to assure that the views of biologists are heard and properly considered.

Entomologists, along with scientists in many other professions, have recently become keenly aware of the need to keep abreast of reports of scientific developments appearing in foreign language technical publications. Russian publications in particular present rather serious difficulties because that language is so little read in this country. However, entomologists have been slow in coming to grips with this problem, or even encouraging a community of effort in its solution. It is interesting, and perhaps significant, to note that a plant scientist, working through the AIBS, was instrumental in arranging for the publication of English translations of Russian biology journals containing articles on entomology. Certainly the program of translation of Russian scientific literature deserves the enthusiastic support of our Society and of entomologists in general.

These are but a few of the more obvious matters that will enter into the relationship between our Society and the AIBS, as I see it. I believe there are other more important, though less obvious, ways in which entomology may benefit by our membership in the AIBS. One of the most important of these might well be referred to as public relations in science, that is, the business of developing and maintaining more productive relationships with related scientific disciplines. Improved relations will not only benefit the disciplines concerned, but as the individual societies that make up the AIBS are strengthened, the Institute will itself become a more powerful influence in the advancement of the biological sciences and their applications to human welfare. Our Society can, in this way, give substance to the cooperative nature of our relations with the AIBS.

Through the years we have taken considerable pride in the fact that entomology, as a profession, was big enough to stand alone—that we could, and usually did, chart our independent courses in most matters, including meeting separately from other organizations. So far as our annual meeting is concerned, within the foreseeable future it will probably remain a strictly entomological function. There are a number of practical considerations that dictate against our entire Society trying to hold joint meetings with other large organizations, except occasionally. Few meeting places could accommodate a convention of that size, and our program is already overcrowded. Furthermore, for the immediate future we have firm commitments as to times and places in which meetings are to be held. Nevertheless, we should ask ourselves if our tendency to remain aloof from other scientific organizations is good.

As the frontiers of entomology are pushed outward, we find that the boundaries of our profession become less and less discrete. Whereas not so long ago our area of scientific interest seemed rather clearly circumscribed, it is now evident that in many facets of our work we must have competence in, or at least considerable knowledge of, several related scientific fields. Although within our profession we are becoming more and more specialized, these specialties are leading their practitioners further and further into other branches of knowledge. Entomology cannot continue

[1] Report of the Glen Committee, March 1958 BULLETIN pp. 26–28, and a resumé of the situation by F. L. Campbell, June 1958 BULLETIN pp. 61–62.

to advance on all fronts unless, as individuals and as a Society, we recognize the need for broadening the base of our relations with other sciences.

Our membership in the AIBS provides an excellent opportunity to do this. One of the stated objectives of that organization is to promote unity and effectiveness of effort among those devoting themselves to the biological sciences. We are, therefore, assured of wholehearted cooperation, if we are willing to do our share. This may require some extra effort on our part, but I am confident the desired results can be accomplished without in any way detracting from our independence as an organization, or interfering with our customary Society activities. The yearly meetings of the AIBS, customarily held at educational institutions, provide the common ground on which segments of our Society can meet with other biological science disciplines. The framers of our Constitution must have had circumstances of this type in mind when provision was made, in Article VI, for Sections to meet "at other times and places" than at our Annual Meeting or with the Branches. It is entirely appropriate that most of our Sections should, on occasion, meet with the AIBS and I urge them to do so. Also, as individuals, we should take advantage of such opportunities to explore areas of scientific inquiry common to entomology and some other of the biological sciences. In this way our Society can, in part, fulfill its obligation to participate in the national effort to advance the science of biology and the application of biological knowledge for the benefit of mankind. This union that we have made can give us strength—if we take advantage of it.

MEETINGS

COLUMBUS, OHIO. Neil House Hotel. March 25, 26, and 27, 1959. The 14th annual meeting of the North Central Branch of the Entomological Society of America. Roscoe E. Hill, *Chairman*, Department of Entomology, College of Agriculture, Lincoln, Nebraska; C. W. Wingo, *Secretary-Treasurer*, 102 Whitten Hall, University of Missouri, Columbia, Missouri.

CHICAGO, ILLINOIS. The Drake Hotel. May 18, 19 and 20, 1959. The 45th mid-year meeting, Chemical Specialties Manufacturers Association. H. W. Hamilton, *Secretary*, C.S.M.A., 50 East 41st Street, New York 17, N. Y.

SACRAMENTO, CALIFORNIA. El Dorado Hotel. June 23, 24, and 25, 1959. The 43rd annual meeting of the Pacific Branch, Entomological Society of America. Leslie M. Smith, *Chairman*, Department of Entomology, University of California, Davis, California; H. H. Keifer, *Secretary-Treasurer*, 1112 Swanston Drive, Sacramento 14, California.

UNIVERSITY PARK, PENNSYLVANIA. Pennsylvania State University. August 30–September 3, 1959. The 10th annual meeting of the American Institute of Biological Sciences, Hiden T. Cox, *Executive Director*, AIBS, 2000 P Street, N.W., Washington 6, D. C.

BILOXI, MISSISSIPPI. Buena Vista Hotel. The 26th annual meeting of the National Pest Control Association. Ralph E. Heal, *Executive Secretary*, Buettner Memorial Building, 250 West Jersey Street, Elizabeth, New Jersey.

FRENCH LICK, INDIANA. Sheraton Hotel. October 21, 22 and 23, 1959. The 26th annual meeting, National Agricultural Chemicals Association. J. V. Vernon, *President*, Niagara Chemicals Division, Food Machinery and Chemical Corporation, Middleport, New York; L. S. Hitchner, *Executive Secretary*, N.A.C.A., 1145 19th Street, N.W., Washington 6, D. C.

ATLANTIC CITY, NEW JERSEY. Chalfonte-Haddon Hall. October 29, 30, 1959. The 31st annual meeting of the Eastern Branch, Entomological Society of America. Reece I. Sailer, *Chairman*, Entomology Research Division, Plant Industry Station, Beltsville, Maryland, L. G. Merrill, Jr., *Secretary-Treasurer*, Department of Entomology, Rutgers University New Brunswick, New Jersey.

DETROIT, MICHIGAN. Sheraton-Cadillac Hotel. November 30–December 3, 1959. First joint meeting Entomological Society of America, Entomological Society of Canada, Entomological Society of Ontario. P. W. Oman, *President*, E.S.A., Entomology Research Division, Plant Industry Station, Beltsville, Maryland; M. L. Prebble, *President*, E.S.C., Forest Biology Division, Science Service Bldg., Carling Avenue, Ottawa, Ontario; A. G. McNally, *President*, E. S. O., Ontario Agricultural College, Guelph, Ontario. R. H. Nelson, *Executive Secretary*, E.S.A., 1530 P Street, N.W., Washington 5, D. C.; L. I. Reed, *Secretary*, E.S.C., Plant Protection Division, Ottawa, Ontario; W. C. Allen, *Secretary*, E.S.O., Ontario Agricultural College, Guelph, Ontario. E. H. Smith, *Chairman of the Program Committee*, E.S.A., New York Agricultural Experiment Station, Geneva, New York; B. N. Smallman, *Chairman of the Program Committee*, E.S.C., Entomology Division, Science Service, Ottawa, Ontario.

WASHINGTON, D. C. Mayflower Hotel. December 7, 8, 9, 1959. The 46th annual meeting of the Chemical Specialties Manufacurers Association. H. W. Hamilton, *Secretary*, C.S.M.A., 50 East 41st Street, New York 17, N. Y.

CHICAGO, ILLINOIS. December 26–30, 1959. The 126th annual meeting of the American Association for the Advance of Science. Dael Wolfle, *Executive Officer*, AAAS, 1515 Massachusetts Avenue, N.W., Washington 5, D. C.

VIENNA, AUSTRIA. August 17–25, 1960. The XIth International Congress of Entomology. Dr. Max Beier, *Secretary General*, c/o Naturhistorisches Museum, Vienna I, Burgring 7, Austria.

POSITIONS OPEN—POSITIONS WANTED

There was an error in one of the listings in the December 1958 issue of the BULLETIN. We are therefore rerunning this listing.

Associate Professor, entomology and parasitology. Desires academic change. U. S. citizen, 40, Ph.D., C.A.P.&E., 15 years experience, numerous publications. Box 9.

We know that among our members there are a great many who hire entomologists, at least occasionally. The Executive Secretary would like to hear from some of these as to whether a column such as this is worthwhile. Are we helping our members?

KARL JORDAN DIES

Karl Jordan, one of the foremost entomologists of the world, died at 98 on January 12, 1959 at a hospital in Hemel Hempstead, England.

His long career was spent almost entirely at the Zoological Museum, Tring, England, of which he was the director for many years. A founder of the International Congress of Entomology, he attended the first nine and was heard via a recording at the tenth in Montreal. Justly famous for contributions in various phases of entomology, he passes from the scene after nearly a century leaving permanent beacons in the zoological sciences.

PHOTO SALON

The insect photographic salon held at the Salt Lake City meeting was very successful and a similar showing is planned for the November 30–December 3, 1959 meeting in Detroit. The committee who will be in charge this year will be announced in the June BULLETIN.

In the meantime, we hope the camera fans among our membership will be on the lookout for new and interesting insect photographs. For some background information see the paper by Leland R. Brown, BULLETIN OF THE ENTOMOLOGICAL SOCIETY OF AMERICA 4(3)73–74, 1958.

The Impact of the Development of Organophosphorus Insecticides upon Basic and Applied Science[1]

By ROBERT L. METCALF[2]

University of California, Citrus Experiment Station, Riverside

I. INTRODUCTION AND HISTORY

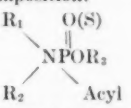
Few scientific discoveries have had as far reaching and dramatic consequences to our profession of entomology as the discovery of the biological activity of the pentavalent phosphorus atom, properly surrounded by lipophilic groups and possessing the requisite chemical instability.

R. L. METCALF

The story of this achievement began over a quarter century ago and, like the famous 1001 Nights Entertainment of Queen Scheherazade, is still growing vigorously despite daily recitals. In our story there are chapters of direct interest to nearly every entomological specialist from the insect physiologist and ecologist to the insecticide chemist and economic entomologist. I have chosen to summarize it on this occasion not only because of my comparative familiarity with a field which has been the subject of personal research interest over the past dozen years, but also because it demonstrates most admirably the impact of the science of entomology upon research and discovery in other scientific fields, upon commercial enterprise and even upon human conflict.

It all began some 26 years ago with a report by Lange and von Kreuger (1932) in the *Berichte der Deutschen Chemischen Gesellschaft* entitled "Uber ester der monofluorphosphosaure". The authors appended a short paragraph describing the biological activity of these substances as: "The strong action of the alkyl esters of monofluorophosphoric acid on the human organism is interesting. The vapor of these compounds smells pleasant and strongly aromatic. However, after a few minutes following the inhalation, a strong pressure appears upon the larynx combined with breathlessness. Then cloudiness of vision and phenomena of the diaphragm with painful sensitivity of the eyes toward light occur. After several hours these phenomena fade away. . . . The action is exerted by very small amounts." The compound diethyl phosphorofluoridate(I)[3] was prepared in the pure state and is, therefore, the common ancestor of all the organophosphorus toxicants.

This unusual observation seems to have passed almost unnoticed save perhaps by Gerhard Schrader in Germany who, incidentally, patented the dialkyl phosphorofluoridates as insecticides in 1939 (German Patent 645/39 Secret, D.P. 767, 153). Dr. Schrader must be accorded the title of "father of the organophosphorus insecticides". Working for the huge Interessen Gemeinschaft Farbenindustrie or I.G.F., he began in 1936, together with his colleague H. Kükenthal, a systematic search of the esters and esteramides of phosphoric and thiophosphoric acids, seeking for suitable synthetic insecticides to replace the natural products nicotine, rotenone, and pyrethrum. The simple symmetrical esters and amides of phosphoric acid had no insecticidal activity, but toward the end of December, 1936, compounds such as *O*-ethyl *N*,*N*-dimethylphosphoroamido fluoridate (Ia) were prepared which had strong myotic properties and which killed 100% of test aphids when sprayed at concentrations of 0.005%. As a result of this work, a patent announcement was made at the beginning of March, 1937, which was released as German Secret Patent 155/39 stating ". . . pest control remedies consisting of or containing phosphoric acid compounds of the general composition:



where R_1, R_2, and R_3 are alkyl residues, and as acyl, the remainder, consists of an inorganic or organic acid such as Cl, F, SCN, CNO, CH_3COO^-" (Schrader 1947, 1952). Although compound Ia was found to be too volatile and too toxic to mamammals to be used as a practical insecticide, its close resemblance to the nerve gases tabun (IV) and sarin (V) is obvious. Further research along this line led to the patenting of tetramethyl phosphorodiamidic fluoride or dimefox (II) in 1940. This compound was the first of the phosphorus insecticides to show strong systemic properties in plants after spraying the leaves or watering the roots as demonstrated by Kükenthal.

In 1938, Schrader turned his attention toward the pyrophosphates and the novel systemic insecticide octamethyl pyrophosphoramide (III), later named schradan in honor of its discoverer, was synthesized in 1942. The history of tetraethyl pyrophosphate or TEPP is exceptionally interesting. This compound (VI) was among the very earliest organophosphorus compounds to be discovered and was described in 1854 by Clermont, as a "thick liquid with a burning taste and peculiar smell". In view of the extremely poisonous nature of this compound (oral LD_{50} to the rat 1.2–2 mg. per kg.) some doubt must be cast upon the quality of Clermont's product. TEPP was again prepared and studied in 1879 by Abbot, in 1896 by Riegel, in 1906 by Cavaller, in 1908 by Rosenheim and Pritze, in 1914 and 1921 by Balarew, in 1930 by Nylen, and in 1931 by the Arbusows (Schrader 1952), without any of these investigators gaining an inkling of the physiological properties of this extremely reactive compound. In 1938, Schrader investigated the condensation products of triethyl phosphate and phosphorus oxychloride and in 1939 discovered the impressive insecticidal activity of TEPP, but did not consider it sufficiently stable for plant protection. He also found a product with the empirical formula $(C_2H_5)_6P_4O_{13}$ which he described as hexaethyl tetraphosphate or HETP. This substance was marketed in Germany in 1944 as a nicotine substitute under the name "Bladan". Careful investigation by Hall and Jacobsen (1948) subsequently showed that HETP is actually a mixture of substances with an average molecular weight and analysis corresponding to the foregoing formula, in which the active ingredient is 20% tetraethyl pyrophosphate, thus rounding out nearly a century of oversight and neglect of a valuable insecticide.

[1] Paper No. 1082, University of California Citrus Experiment Station.

[2] Professor of Entomology and Entomologist in the Experiment Station. Presidential Address, Sixth Annual Meeting, Entomological Society of America, Salt Lake City, Utah, December 1, 1958.

[3] Numbers of compounds refer to structural formulae in Figure 1, unless otherwise shown.

TEPP is very unstable in water (half-life about 7 hours at 25° C.) and thus does not leave poisonous residues on treated produce. However, many insecticidal applications in Germany were made together with lime as a fungicide and a lime-stable organophosphorus insecticide was clearly desirable. Schrader, therefore, investigated the properties of the corresponding pyrophosphates in which the thiophosphoryl group P = S replaced the phosphoryl group P = O. The compounds tetraethyl monothionopyrophosphate (VIII) and tetraethyl dithionopyrophosphate or sulfotepp (VII) had been prepared by the Arbusows in 1931, and were found by Schrader and Kükenthal to be highly toxic to insects. Compound (VIII), although the most active, was stable in water but not in lime water, but sulfotepp was acceptably stable in lime water and was patented in 1944 as an insecticide.

1. Chemical Warfare Investigations.—Schrader (1952) states that in 1938 the work on organophosphorus insecticides was declared to be "secret" by the German government and that no more publications or patents were issued until the end of the war. The researches already mentioned had shown the high mammalian toxicity of substances such as Ia and II and the intense myotic activity of diethyl phosphorofluoridate. Extensive efforts were, therefore, directed toward the development of chemical warfare agents of the organophosphorus type in both Germany and England. A detailed discussion of the results is beyond the scope of this paper, and, indeed, many of the details are as yet classified as military secrets. It is however, of interest to note that in Germany three highly effective antipersonnel agents or "nerve gases" were developed. Tabun or *O*-ethyl *N*,*N*-dimethylphosphoroamido cyanidate (IV) was patented by Schrader and Kükenthal in February, 1937, as German Patent 767,723 but not issued until September, 1952, and was being manufactured at the rate of 100 tons per month by the end of the war. The more toxic sarin *O*-isopropyl methyl-phosphonofluoridate (V) and soman *O*-3,3-dimethyl-2-butyl methylphosphonofluoridate were also being prepared for use.

In England, of necessity working entirely independently, Saunders and McCombie (Saunders 1957) reinvestigated the dialkyl phosphorofluoridates and discovered and patented dimefox (II) as an insecticide in 1944 as British Patent 602,446. In the same year, the hybrid ester *O*-ethyl *N*,*N*-dimethylphosphoroamidofluoridate (Ia) which had been prepared by Schrader in 1936 was found to be highly toxic. Although much of the work on these chemical warfare agents is still hidden in secret archives, excellent studies of the properties and pharmacological action of tabun (Holmstedt 1951) and sarin (Fredriksson 1958) have appeared. Tammelin (1958) has shown that *O*-ethyl *S*-dimethylaminoethyl methylphosphonothiolate methiodide (LD_{50} i.p. to the mouse 0.03 mg. per kg.) is about 10 times as toxic as sarin (LD_{50} 0.42 mg. per kg.).

This grim offshoot of the insecticide business has continued to flourish during the years of the cold war. Some idea of the magnitude of the operations may be gained from the announcement in 1954 that a $50,000,000 factory for the production of nerve gas intermediates had been constructed at Muscle Shoals, Alabama (Anon. 1954).

2. Post-war Developments and Present Commercial Status.—The insecticidal substances mentioned above were highly effective against small sucking insects but were not entirely suited to control the Colorado potato beetle, *Leptinotarsa decemlineata* (Say), which was an especially important pest in post-war Germany because of the acute food shortage. Schrader, therefore, resumed his investigations and by August, 1945, had found three compounds highly effective against this pest. These were the acetoacetic ester derivative, diethyl 2-ethoxycarbonyl-1-methylvinyl phosphate, the diethyl analogue of Phosdrin (XXIV), diethyl *p*-nitrophenyl phosphate or para-oxon (IX), and its thiono-analogue *O*,*O*-diethyl *O*-*p*-nitrophenyl phosphorothionate or parathion (X). These compounds were extremely toxic to a very wide variety of insects and parathion in particular was lime stable and somewhat less toxic to warm-blooded animals.

Allied investigational teams entering Germany in 1945 interrogated Schrader (BIOS Reports 714 and 1808) and published somewhat fragmentary reports of his discoveries. Their importance was not immediately appreciated everywhere, but soon samples of HETP, dimefox, schradan, and parathion began to filter into research centers where they were eagerly evaluated and were found to have unprecedented insecticidal activity. Nor were they lacking in overall biological potency. Entomologists began to learn new cautions in handling pesticides and such formerly esoteric words as myosis, cholinergic, and cholinesterase became commonplace at our scientific gatherings.

From this point onward, development in this field has proceeded at an incredible pace, and no attempt will be made to continue the detailed chronology further. Literally hundreds of chemists in more than a dozen major chemical firms in at least eight countries of the world have engaged in the synthesis of organophosphorus esters and it is estimated that some 50,000 new organophosphorus compounds have been made and evaluated for insecticidal action. One of the most amazing facets of the subject is the amost incredible diversity of structure in which the active phosphorylating central atom can be cloaked (see FIGURE 1, TABLE I). The principles relating chemical structure to toxic action are so well understood today that a skillful chemist can produce a compound with some degree of biological activity at nearly every attempt. The chief problems commonly encountered are concerned with the wise utilization of these riches, in attempting to select and develop compounds with unique types of action, low mammalian toxicity, and especially advantageous for commercial development

At this writing there are approximately 40 organophosphorus pesticides in commercial or semi-commercial usage on a world-wide basis. These are summarized in TABLE I, together with their general fields of usefulness, and represent a wide diversity of chemical structures and properties and of insecticidal activity. Some of these compounds, such as parathion, methyl parathion, EPN, malathion, Guthion, Trithion, and Diazinon are general purpose insecticides. Others are effective for highly specialized uses: as plant and animal systemics, seed treatments, stomach poisons and selective insecticides, which will be considered in subsequent sections.

The production, formulation, and marketing of these compounds involves a very sizable segment of the agricultural chemical industry. This may be appreciated from the following estimates[4] of total annual world production of the major items. Parathion and methyl parathion, 20,000,000 lbs.; malathion, 10,000,000 lbs.; Diazinon, 1,000,000 lbs.; Trithion, 1,000,000 lbs.; Guthion, 1,000,000 lbs.; Systox and Meta-Systox, 500,000 lbs.; TEPP, 400,000 lbs.; Phosdrin, 250,000; schradan, 100,000 lbs.; Thimet, 100,000 lbs. The technical production of these items must have an aggregate value of close to $50,000,000 annually.

It is instructive and amusing to take a brief look at pathways of development in this field, as shown in FIGURE 1, where the structural formulae for nearly all the types of successful organophosphorus toxicants are arranged in the imagined phylogeny (to use the term loosely) of their development, from their common ancestor diethyl phosphorofluoridate (I). Some pathways of this developmental pattern are more heavily trodden than others, due to the imparting of especially favorable properties, e.g., of exceptional stability and residual action as in the phosphorothionates and phosphorodithioates. In other directions, as for example the "nerve gases", so little public information is available that it is difficult to ascertain the true dimensions of success. Much of the exploration of the organophosphorus field has been imitative, a motivation which has proven highly profitable for the development of commercial compounds, although this has led to the neglect of a number of highly promising leads, as for example the alkylphosphonates such as (XXIX) which

[4] These figures represent at best only intelligent guesses, since production figures of patented items are not available even for the United States.

TABLE I

ORGANOPHOSPHORUS INSECTICIDES IN COMMERCIAL OR SEMICOMMERCIAL USE—1958.

Common or trade name	Compound	Formula number
A. *General Purpose Residual Insecticides and Acaricides*		
parathion	*O,O*-diethyl *O*-*p*-nitrophenyl phosphorothionate	X
methyl parathion	*O,O*-dimethyl *O*-*p*-nitrophenyl phosphorothionate	
Diazinon[a]	*O,O*-diethyl *O*-(2-isopropyl-4-methyl-6-pyrimidyl) phosphorothionate	XII
Guthion[1]	*O,O*-dimethyl *S*-(1,2,3-benzotriazinyl-4-keto)-3-methyl phosphorodithionate	XXI
Trithion[2]	*O,O*-diethyl *S*-(*p*-chlorophenylthio)-methyl phosphorodithioate	XXII
Phenkaptone[3]	*O,O*-diethyl *S*-(2,5-dichlorophenylthio)-methyl phosphorodithioate	
EPN	*O*-ethyl *O*-*p*-nitrophenyl phenylphosphonothionate	XXX
malathion	*O,O*-dimethyl *S*-(1,2-dicarboethoxyethyl) phosphorodithionate	XVII
Potasan[4]	*O,O*-diethyl *O*-(4-methylumbelliferone) phosphorothionate	XI-H
dicapthon	*O,O*-dimethyl *O*-(2-chloro-4-nitrophenyl) phosphorothionate	XVIII-Cl-2
Cnlorthion[4]	*O,O*-dimethyl *O*-(3-chloro-4-nitrophenyl) phosphorothionate	XVIII-Cl-3
Dition[5]	*O,O*-diethyl *O*-(3,4-tetramethylene-7-hydroxy-coumarin) phosphorothionate	
sulfotepp	tetraethyl dithionopyrophosphate	VII
Dipterex or Dylox[1]	*O,O*-dimethyl 1-hydroxy-2,2,2-trichlorethylphosphonate	XXVIII
Delnav[6]	2,3-*p*-dioxanedithiol *S,S*-bis-(*O,O*-diethylphosphorodithioate)	XXXII
Phostex[7]	mixture of bis-(dialkylphosphinothioyl)-disulfides	
ethion	bis-[*S*-(diethoxyphosphinothioyl)-mercapto]-methane	XXXI
B. *Contact Insecticides of Short Residual Action*		
TEPP	tetraethyl pyrophosphate	VI
DDVP	*O,O*-dimethyl *O*-2,2-dichlorovinyl phosphate	XXV
Dibrom[8]	*O,O*-dimethyl *O*-(2,2-dichloro-1,2-dibromoethyl) phosphate	XXVII
C. *Plant Systemic Insecticides*		
dimefox	tetramethylphosphorodiamido fluoridate	II
Phosdrin[9]	*O,O*-dimethyl *O*-1-methoxycarbonyl-1-propen-2-yl phosphate	XXIV
schradan	octamethyl pyrophosphoramide	III
demeton or Systox[1]	*O,O*-diethyl *O*-(and *S*-)-ethyl-2-thioethyl phosphorothioates	XIII and XVI
Meta-Systox[1]	*O,O*-dimethyl *O*-(and *S*-)-ethyl-2-thioethyl phosphorothioates	
Di-Syston[1]	*O,O*-diethyl *S*-ethyl-2-thioethyl phosphorodithioate	XV-n-2
Thimet[10]	*O,O*-diethyl *S*-methyl-2-thioethyl phosphorodithioate	XV-n-1
Ekatin[11]	*O,O*-dimethyl *S*-ethyl-2-thioethyl phosphorodithioate	
dimethoate	*O,O*-dimethyl *S*-methylcarbamoylmethyl phosphorodithioate	XXIII
Amiton oxalate or Tetram[12]	*O,O*-diethyl *S*-(2-ethyl-*N,N*-diethylamino) phosphorothiolate hydrogen oxalate	XXXIII
Phosphamidon[13]	*O,O*-dimethyl *O*-(2-chloro-2-diethylcarbamoyl-1-propen-2-yl) phosphate	XXVI
Fostion EP[5]	*O,O*-diethyl *S*-methylcarbamoylisopropyl phosphorodithioate	
Fostion MP[5]	*O,O*-dimethyl *S*-methylcarbamoylisopropyl phosphorodithioate	
D. *Animal Systemic Insecticides*		
Co-Ral[1]	*O,O*-diethyl *O*-(3-chloro-4-methylumbelliferone) phosphorothionate	XI-Cl
Trolene[14]	*O,O*-dimethyl *O*-(2,4,5-trichlorophenyl) phosphorothionate	XIX
Dowco 109	*O*-(4-tert-butyl-2-chlorophenyl) *O*-methyl phosphoroamidothionate	

[1] Trademark Chemagro Corp.
[2] Trademark Stauffer Chemical Co.
[3] Trademark J. R. Geigy, A.-G.
[4] Trademark Farbenfabriken Bayer A.-G.
[5] Trademark "Montecatini" Societa generale
[6] Trademark Hercules Powder Co.
[7] Trademark Food Machinery and Chemical Corp.
[8] Trademark California Spray Chemical Corp.
[9] Trademark Shell Chemical Corp.
[10] Trademark American Cyanamid Co.
[11] Trademark Sandoz Ltd.
[12] Trademark Imperial Chemical Industries, Ltd.
[13] Trademark C.I.B.A., Ltd.
[14] Trademark Dow Chemical Co.

seem to have had systematic study in the USSR (see Razumov 1957, Razumov et al. 1957, Paikin et al. 1957).

With this brief historical survey and orientation as to the present status of development of the organophosphorus insecticides, let us turn to consideration of the influence of these discoveries in basic and applied science.

II. ORGANIC CHEMISTRY

Before the discovery of the organophosphorus insecticides the organic chemistry of phosphorus was of limited interest and was systematically explored by a few pioneers of whom C.A.A. Michaelis in Germany and A. E. and E. I. Arbusow of the USSR were the most productive. Their contributions along with those of many other workers have been summarized by Kosalopoff (1950). The recent volume of journal and patent literature in this field is staggering and consists of thousands of items dealing not only with insecticides but also oil additives, polymers, plasticizers, and intermediates in biochemical phosphorylation. A few significant results will be discussed here to typify the contributions to this field made directly as a

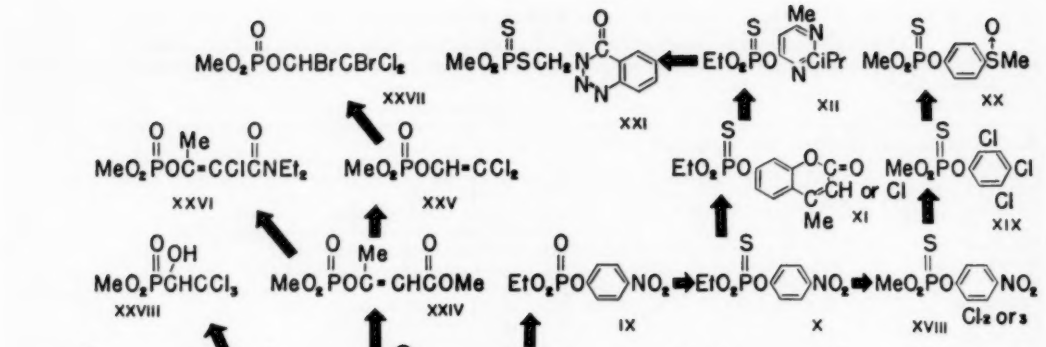


FIGURE 1. "Phylogeny" of development of organophosphorus toxicants from the ancestral form diethyl phosphorofluoridate. Lines of development extend in the directions indicated by the arrows. The Roman numerals refer to compounds mentioned in the text and in TABLE I.

result of studies with insecticides. The rather complicated systematic nomenclature of the organophosphorus compounds is discussed by Kosalopoff (1950) and Saunders (1957). As is typical of most organic compounds, the individual compounds can often be named correctly in several different ways.

1. Purity and Identity of Structure.—Much of the early literature relating to the synthesis of organophosphorus compounds is of uncertain value because of lack of suitable characterization of the product. The history of TEPP and HETP previously referred to is characteristic. Today these difficulties have been largely solved because of modern physico-chemical methods of characterization. Infra red spectrophotometry is indispensible in determining the various bonds between phosphorus and other elements as shown by the following characteristic absorption frequencies in cm.$^{-1}$ (Bellamy 1954, Nyquist 1957, and Larsson 1958):

P = O	1170–1310 (s.)	P-NC_2	700–760
PO-C aliph.	1110–1190 (v.s.)	P-C	650–910
PO-C arom.	1190–1240 (s.)	PC≡N	2230
P-OC	720–750, 950–1050	P-F	800–980 (s.)
P = S	700–840 (v.w.)	P-Cl	430–600 (s.)
PS-C	625–645	P-H	2325–2440 (m.)
P-SC	570–605	P-OH	950–1035
PN⟨C C	990–1010	PO-H	2500–2700

Infrared spectroscopy can also be used for quantitative studies of various constituents and for assessing the relative reactivity of various bonds such as P-F (Larsson 1958) and P-O-aryl (Fukuto and Metcalf 1956).

Column and reversed phase paper chromatography with silicone, propylene glycol, or mineral oil has been especially useful in separating trace constituents and complex mixtures (Metcalf and March 1953a, March *et al.* 1954). The incorporation of the short-lived ($t^{1/2}$ 14.3 days), high activity β-emitter (1.701 mev) P^{32}-radioisotope into various compounds has resulted in the solution of difficult problems in mechanisms of reaction and in rearrangements and transformations (Dahm, 1957). High resolution nuclear magnetic resonance spectroscopy is especially suited to investigations of phosphorus compounds and their reactions (Callis *et al.* 1957).

The formation of impurities by side reactions during synthesis or by rearrangement upon storage has played an important role in the development of our knowledge concerning the reactivity of the organophosphorus insecticides. Early preparations of such compounds as the dialkyl aryl phosphates and phosphorothionates were generally contaminated with very appreciable amounts of the extremely toxic and reactive dialkyl pyrophosphates. The formation of the pyrophosphate esters from diethyl phosphorochloridate commonly used as an intermediate in synthesis occurs very rapidly in the presence of

traces of moisture and Aldridge and Davison (1952) have shown that supposedly pure samples of a series of diethyl aryl phosphates contained up to 5.4% of TEPP. The importance of trace amounts of TEPP, which inhibits ChE at concentrations as low as 1×10^{-9} M (0.3 γ per liter), in studies of the kinetics of ChE inhibition by compounds which are generally much weaker inhibitors is obvious and it has become the general practice to allow aqueous solutions of such compounds intended for physiological study to stand overnight in order to remove the TEPP by its rapid destructive hydrolysis.

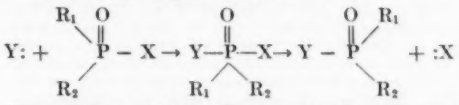
An especially interesting example of the difficulties caused by this general reaction is the case of Diazinon (XII), *O,O*-diethyl *O*-(2-isopropyl-4-methyl-6-pyrimidyl) phosphorothionate. This compound (oral LD_{50} mouse 120 mg/kg, I_{50} 0.8 mg%) was found to increase in toxicity upon heating to 100° C. for 48 hrs. with 0.2% water to give an LD_{50} of 25 mg/kg along with a greatly increased anticholinesterase action, I_{50} 0.0004 mg.%. By a clever piece of chemical work it was shown that in the presence of as little as 0.1 – 0.2% water, up to 14% of tetraethyl monothiopyrophosphate (VIII) (oral LD_{50} mouse 4.2 mg./kg., I_{50} 0.000055 mg. %) and a strong anticholinesterase was readily formed by decomposition and rearrangement (Margot and Gysin 1956).

The isomerization of phosphorothionates to phosphorothiolates has proved of great importance in the preparation and study of the organophosphorus insecticides. Early investigations of parathion and methyl parathion indicated that these compounds were relatively active as anticholinesterases (I_{50} ca. 1×10^{-6} M). Subsequently, however, it was shown that the anticholinesterase activity of supposedly pure samples was in fact due to traces (0.1 – 1%) of the corresponding *S*-alkyl phosphorothiolates which have I_{50} values for ChE about 2×10^{-8} M, and hydrolyze several hundred times as rapidly. This isomerization reaction is favored by heat and the presence of polar solvents and is much more rapid with *O,O*-dimethyl phosphorothionates than with longer chain dialkyl esters, and has caused considerable difficulty in regard to stability upon storage (Martin 1950, Metcalf and March 1953b).

The isomerization reaction has been used to advantage in the preparation of *O,O*-diethyl *S*-ethyl-2-thioethyl phosphorothiolate (Systox thiol-isomer) (XIV) from the corresponding *O,O*-diethyl *O*-ethyl-2-thioethyl phosphorothionate (Systox thiono-isomer) (XIII), with the dimethyl ester of this compound, and with *O,O*-diethyl *S*-ethyl-2-diethylamino phosphorothiolate (Amiton) (XXXIII) which are prepared from the corresponding phosphorothionates by heating. Fukuto has investigated the mechanism of this reaction in both series of compounds and has concluded that it proceeds through the formation of a cyclic sulfonium ion with Systox or immonium ion with Amiton (Fukuto and Metcalf 1954, Fukuto and Stafford 1957). Meta-Systox is unstable under storage, especially in aqueous conditions and Heath and Vandekar (1957) have demonstrated that this compound readily undergoes self-methylation to form the sulfonium salt.

The rearrangement of Dipterex *O,O*-dimethyl 2,2,2-trichloroethyl-1-hydroxyphosphonate (XXVIII) to DDVP *O,O*-dimethyl 2,2-dichlorovinyl phosphate (XXV) is of both fundamental and practical interest. The latter compound was isolated as a highly toxic trace impurity in Dipterex and subsefiuently prepared by treating Dipterex with strong alkali (Mattson *et al.* 1955). DDVP is a very strong anticholinesterase I_{50} 1×10^{-9} M, although Dipterex is non-inhibitory. From recent work it is now clear that the anticholinesterase action formerly attributed to Dipterex is in fact due to this rearrangement which occurs rapidly in aqueous media at pH 7–8, and that the formation of DDVP is responsible for the toxic action of Dipterex (Metcalf et al. 1959).

2. Reactivity of Organophosphorus Toxicants. It appears that most of the generalized reactions of the toxic organophosphorus esters, i.e. the biochemical reactions with esterase enzymes discussed in Section III-1, the hydrolysis in aqueous or alkaline systems, and the reaction with hydroxylamine derivatives, are simple bimolecular displacement reactions of the S_N2 type. These result from the attack of a nucleophilic reagent, or enzyme group, upon the electrophilic phosphorus atom as indicated by the generalized reaction:



The reactivity of the individual phosphorus esters is determined by: (a) the magnitude of electrophilic character of the phosphorus atom, (b) the strength of the bond P – X, and (c) the steric effects of the substituents. These factors have been discussed in detail by Fukuto (1957) and Larsson (1958) and only a brief summary will be attempted here.

The electrophilic nature of the central phosphorus atom is determined by the relative positions of the shared electron pairs between atoms bonded to phosphorus and is a function of the relative electronegativities of the two atoms involved in each bond (values for atoms commonly concerned are: P 2.1, O 3.5, S 2.5, N 3.0, F 4.0, C 2.5, and H 2.1). The substituent groups on the phosphorus atom affect its electrophilic nature mainly by both inductive (I) and mesomeric (M) effects which may be transmitted along chains of atoms and may be positive (electrons repelled) or negative (electrons attracted).

The reaction of nucleophilic reagents such as cholinesterase or OH^- with the toxic organophosphorus compounds commonly results in hydrolysis at the P-X bond with the liberation of an alcoholic or acidic moiety HX. The rate of this reaction is increased by any variation in the substituent groups which decreases the electron density about the phosphorus atom and thus enhances the attraction between the reactants. Quantitative studies of reaction rates with cholinesterase or OH^-, therefore, give a picture of these electronic effects.

In studies with diethyl substituted phenyl phosphates, Fukuto and Metcalf (1956) have used Hammett's sigma value as a quantitative measure of the effect of electron-withdrawal by substituent groups upon the reactivity of the P-X bond. A highly satisfactory degree of correlation was found between phenyl substituents which were highly electron-attracting ($+\sigma$) and high reactivity in alkaline hydrolysis, cholinesterase inhibition, and toxicity to the house fly. Typical data are shown below:

Phenyl substituent	I_{50} cholinesterase *M.*	LD_{50} *Musca domestica*	σ
p-NO_2	2.6×10^{-8}	0.5	1.270
p-CN	1.3×10^{-7}	3.5	1.000
p-CH_2SO_2	2.5×10^{-7}	2.5	1.049
p-Cl	3×10^{-5}	150	0.227
p-H	1×10^{-3}	>500	0.0
p-t-C_4H_9	1.0×10^{-4}	>500	−0.197
p-MeO	$>1 \times 10^{-3}$	>500	−0.268

Brock (1957) has shown that the effect of various alkyl substituents of tetraalkyl pyrophosphates upon aqueous hydrolysis is in excellent agreement with the combination of inductive and steric effects as expressed quantitatively by Taft's polar substituent constants (σ^*). Typical data are shown below:

Alkyl substituent	$k_{hyd} \times 10^3$ min.$^{-1}$	σ^*
methyl	25	0.000
ethyl	1.6	−0.200
propyl	0.65	−0.230
isopropyl	0.09	−0.760

Hydrolysis of the organophosphorus esters, as indicated above, is a very fundamental property. Alkaline hydrolysis

of tertiary phosphorus esters is generally characterized by a nucleophilic attack and consequent rupture of the phosphorus to oxygen bond as has been confirmed by studies in water containing O^{18} (Blumenthal and Herbert 1945). Certain exceptions are known such as malathion and *O,O*-diethyl *O*-2-diethylaminoethyl phosphorothionate, which in strongly alkaline solution are hydrolyzed at the carbon-sulfur and carbon-oxygen bonds respectively. Compounds with P-F bonds, such as diethyl phosphorofluoridate (I), liberate fluoride in both alkaline and acidic hydrolysis, but tabun (IV) with a P-CN bond, liberates cyanide in alkaline hydrolysis and in acid is split at the P-N bond between phosphorus and dimethylamino-groups. In acidic hydrolysis of the tertiary phosphorus esters, the attack is at the carbon-oxygen bond and in contrast to alkaline hydrolysis the attack is continued upon secondary and eventually primary esters (Fukuto 1957).

The development of fundamental relationships between the structure of organic compounds and chemical reactivity is progressing rapidly, and the limited number of studies made to date with the organophosphorus toxicants illustrate the value of this approach in the synthesis of highly effective new molecules.

3. Optical Isomerism.—The tetrahedral phosphorus atom surrounded by four fundamentally different chemical groups has been known to exist in mirror image forms which are optically active, since the work of Meisenheimer and Lichtenstadt (1911). The successful resolution of the organophosphorus toxicant *O*-ethyl *S*-(2-ethylthioethyl) ethylphosphonothiolate into its *d*- and *l*-isomers has been recently reported by Aaron, Michel, Witten, and Miller (1958) who resolved the *O*-ethyl ethylphosphonothioic acid by means of its quinine salts (Aaron, Shryne, and Miller 1958), and synthesized the phosphonate esters of both optically active forms.

It was shown for the first time with these compounds that the *l*-form combined with eel cholinesterase and horse serum cholinesterase 20 times as rapidly as the *d*-form, and with human red cell and bovine red cell ChE 10 times as rapidly. Subsequently, Fukuto and Metcalf (1959) have shown that this compound is a highly effective insecticide and that the *l*-form is 6 to 10 times as toxic to the house fly and mosquito larvae as is the *d*-form, and the *l*-isomer was 10 times as active as the *d*-form in the inhibition of house fly cholinesterase. This information has an important bearing on our knowledge of the active surface of the cholinesterase molecule, which must be assymetric in nature even though the normal substrate acetyl choline is not optically active. It is of additional interest here that evidence has been presented by Augustinsson and Heimburger (1954) and Adie, Hoskin, and Trick (1956) to show that a phosphoryl phosphatase selectively hydrolyzes one of the stereoisomers of tabun but not of sarin.

III. BIOLOGICAL CHEMISTRY

A detailed consideration of the contributions to biological chemistry resulting from the study of organophosphorus insecticides is quite beyond the scope of this work and only a brief survey will be made. The very reactivity that makes these compounds successful animal poisons makes them invaluable tools for research on the mode of action of enzymes, on the functions of nerve and muscle, and in mechanisms of detoxication. The ready availability and ease of synthesis of compounds labeled with the radioisotope P^{32} has been of inestimable value in biochemical studies (Dahm 1957).

1. Mechanism of Esterase Inhibition.—The first demonstration of the biochemical role of a toxic organophosphorus compound DFP was apparently that of Adrian, Feldberg, and Kilby at Cambridge and Dixon, Mackworth and Webb at Oxford in 1942 (Saunders 1957) who showed that this compound inactivated the cholinesterase enzyme (ChE) whose normal function is the destructive hydrolysis of the neurohormone acetylcholine (ACh), at concentrations as low as 1×10^{-9} M. From this it was deduced that the inhibition of this enzyme which results in the accumulation of ACh at vital centers produced the characteristic cholinergic symptoms of intoxication. Since that time a vast amount of study has been given to the biochemistry of this process, not only in mammals but also in insects (Section IV-1), and with purified enzymes such as the ChE of the electric eel, red blood cells, and with crystalline chymotrypsin. It is safe to say that more is known about the active sites and mechanisms of hydrolysis by and inhibition of these esterases than of any other enzymes.

The reaction between esterase and phosphorus inhibitor (B) is bimolecular of the well known S_{N2} type (Section II-2) and mimics the normal 3-step reaction between enzyme and substrate (A):

$$\text{(A)}\quad \mathrm{CH_3\overset{O}{\overset{\|}{C}}OCH_2CH_2\overset{+}{N}Me_3} + \mathrm{EH} \underset{(1)}{\overset{Ke}{\rightleftarrows}}$$

$$\mathrm{CH_3\overset{O}{\overset{\|}{C}}OCH_2CH_2\overset{+}{N}Me_3{-}EH} \xrightarrow[(2)]{k_1}$$

$$\mathrm{CH_2\overset{O}{\overset{\|}{C}}.E} + \mathrm{HOCH_2CH_2\overset{+}{N}Me_3} \xrightarrow[(3)\ H_2O]{k_2}$$

$$\mathrm{CH_3\overset{O}{\overset{\|}{C}}OH} + \mathrm{EH}$$

$$\text{(B)}\quad \mathrm{(RO)_2\overset{O}{\overset{\|}{P}}X} + \mathrm{EH} \underset{(1)}{\overset{Ke}{\rightleftarrows}} \mathrm{(RO)_2\overset{O}{\overset{\|}{P}}X{-}EH} \xrightarrow[(2)]{k_1}$$

$$\mathrm{(RO)_2\overset{O}{\overset{\|}{P}}.E} + \mathrm{HX} \xrightarrow[(3)\ H_2O]{k_2}$$

$$\mathrm{(RO)_2\overset{O}{\overset{\|}{P}}OH} + \mathrm{EH}.$$

In reaction (A), step 3 occurs very rapidly and step 1 is the rate-determining step; while in the inhibition reaction (B), step 3 occurs very slowly and is the rate determining step (Metcalf 1955, Fukuto 1957). Thus it has been demonstrated with both acetylcholine esterase and chymotrypsin that: (a) Inhibitors such as DFP, TEPP, and para-oxon engage in first order reactions with the enzymes, (b) the inhibited enzyme is a relatively stable phosphorylated compound containing one mole of phosphorus per mole of enzyme, and (c) as a result of the reaction an equimolar quantity of alcoholic or acidic product (HX) is liberated.

It seems probable that all the organophosphorus irreversible inhibitors react in the same manner, the rate of reaction k_1 being determined by the nature of the bond P-X and the electrophilic properties of the phosphorus atom, the size, shape and inductive properties of the other groups attached to phosphorus, and optimum configuration or electrostatic charge which promotes affinity for the active site on the enzyme surface. The rate of reversal of inhibition k_2 by hydrolysis of the phosphorylated enzyme is influenced by the nature of the groups attached to phosphorus atom after phosphorylation, and for dialkyl esters takes place in the order methyl > ethyl > isopropyl. This reversal can be greatly accelerated by nucleophilic reagents such as the oximes; hydroxylamine, monoisonitrosoacetone, nicotinhydroxamic acid methiodide, and 2-pyridylaldoxime methiodide (PAM) which act directly to displace the phosphorus atom from the enzyme by kinetics similar to the normal enzymatic hydrolysis (Davies and Green 1956). The last mentioned compound PAM has been suggested as a useful agent for the therapy of

cases of organophosphorus poisoning (Wilson and Ginsburg 1955).

The active site of the ChE molecule is currently pictured (Bergmann *et al.* 1956) as consisting of a sequence of peptide combinations characterized by an esteratic site $pK_a \approx 6.5$, probably the imidazole ring of histidine and $pK_b \approx 9.3$, probably the *p*-OH group of tyrosine; and anionic sites (2 in AChE and 1 in pseudo ChE) which are possibly the free carboxylic acid groups of aspartic or glutamic acid. The inhibition of the active site by an organophosphorus poison is now believed to be a two-step process, comprising first a reaction with histidine and a subsequent transfer to the hydroxy group of serine, since enzymatic hydrolysis and separation of ChE inhibited with P^{32} DFP showed the radiophosphorus attached to serine (Wagner-Jauregg and Hackley 1953; Schaffer *et al.* 1954).

Parallel studies with chymotryosin have shown that DFP^{32} enzyme upon enzymatic hydrolysis yields the diisopropyl phosphoryl peptide: glycyl-aspartyl-seryl-glycyl-glycyl-prolyl-leucine in which the P^{32} is also attached to the hydroxy-group of serine (Oosterbaan *et al.* 1958). These studies with radioactive DFP have thus added valuable information to our knowledge of the function and structure of enzymes.

2. Metabolism.—The great reactivity of the pentavalent phosphorus compounds results not only in their toxic properties but also makes them very susceptible to metabolism and degradation in the biological systems of insects, plants, and mammals. A detailed knowledge of these biochemical processes is of fundamental importance in understanding the mode of action of the organophosphorus compounds as contact and stomach poisons, and as plant and animal systemics. Two general types of reactivity have been recognized: (a) metabolic intoxication of non-toxic or moderately toxic compounds to more active derivatives, and (b) metabolic detoxication, leading to destructive hydrolysis.

Metabolic intoxication of several distinct types has been demonstrated:

(a) By oxidation of esters containing the P = S grouping to P = O as in parathion, EPN, Thimet, Di-Syston. The pure phosphorothionates are generally weak anticholinesterases because they are too stable to phosphorylate ChE. Their oxidation by enzyme systems in the mammalian liver and insect gut, fat body, malpighian tubes, or nerve tissue, or in the case of systemic insecticides intracellularly in plants, to the relative unstable P = O compounds with strong anticholinesterase activity is a major feature in the toxic action of these materials (Metcalf and March 1953c).

(b) By oxidation of thiol ether -S- to sulfoxides $-\overset{\overset{O}{\uparrow}}{S}-$ and sulfones $-\underset{\underset{O}{\downarrow}}{\overset{\overset{O}{\uparrow}}{S}}-$ as in Systox, Di-Syston, Thimet, and Trithion (XXII). This reaction which may occur in the mammalian liver, insect body, or with the systemic insecticides in plant cells, results in the establishment of an electrophilic center in the molecule which increases the instability and consequent phosphorylating ability of the compound (Fukuto *et al.* 1955). Reactions (a) and (b) may occur simultaneously in phosphorodithioates such as Di-Syston or Thimet so that a sequence of four oxidation products may appear (Metcalf *et al.* 1957).

(c) By oxidation and rearrangement of the weakly cholinergic phosphoroamidates schradan and dimefox to unstable highly active anticholinesterases by oxidation of $-N-CH_3$ to the electrophilic $-\overset{\overset{O}{\uparrow}}{N}-CH_3$ followed by rapid rearrangement to the methylol $-N-CH_2OH$. This enzymatic oxidation occurs in the insect fat body, gut, cuticle, and nerve cord; in the mammalian liver; and slowly in plant cells (Arthur and Casida 1958; Spencer and O'Brien 1955).

Metabolic detoxication takes place largely by base catalyzed hydrolysis which may be partially enzymatic in nature (see Section II-2). The rapidity of hydrolysis may be increased by the introduction of electrophilic groups in the metabolic oxidation processes referred to above. The hydrolytic attack generally affects the labile bond broken during phosphorylation of the enzyme, leaving a dialkyl phosphoric acid ester and an alcohol or phenol, but with some compounds such as Korlan (XIX) hydrolysis may also occur at one of the short chain aliphatic ester links (Plapp and Casida 1958). Various enzymes have been described as specific detoxifying agents, including DFP-ase from rabbit liver, kidney, and plasma (Mazur 1946), tabunase from rabbit and horse plasma which splits CN^- from tabun (Augustinsson and Heimburger 1954), A-esterase of mammalian plasma which hydrolyzes para-oxon (Aldridge 1953) and aromatic esterase from insect tissues which hydrolyzes para-oxon and parathion to liberated *p*-nitrophenate ion (Metcalf *et al.* 1956).

IV. INSECT PHYSIOLOGY

The organophosphorus insecticides have a characteristic effect on the insect nervous system as manifested by their toxic action in causing the sequence of symptoms of tremors, hyperactivity, convulsions, paralysis, and death. Investigations of the mode of action of these compounds and their use as pharmacological tools have had a profound effect on the development of our knowledge of the physiology and biochemistry of the insect nervous system.

1. Cholinesterase and Acetyl Choline.—Before the advent of DFP, TEPP, and parathion little was known about the nature of the neurohormones in insects. Cholinesterase (ChE) activity had been found in the central nervous system of several species and a substance with properties similar to acetyl choline (ACh) had been demonstrated in the central nervous system of *Periplaneta americana* L. However, no pharmacological response could be elicited by the direct application of ACh. Inasmuch as the action of the organophosphorus toxicants on mammals seemed quite clearly associated with specific inhibition of the ChE enzyme and the consequent accumulation of ACh at vital centers, resulting in the well known cholinergic symptoms of poisoning by these toxicants (Section VIII) it seemed most logical to seek a parallel mode of action in insects. The insect central nervous system has been found to contain extremely high amounts of ChE. In the brain of the house fly the activity is such as to split about 2 g. of ACh per g. of tissue per hour, a rate about 50 to 100 times that of the mammalian brain and nearly equal to that of the electric organ of the eel *Electrophorus electricus* commonly considered the highest known source (Metcalf and March 1950). Insect central nervous tissue contains a specific acetyl cholinesterase almost indistinguishable in properties from that of mammals, which exhibits a higher affinity for acetyl choline than for any other choline ester, is readily inhibited by excess substrate showing typical bell-shaped substrate concentration vs. activity curves, has a strongly negatively charged anionic site, complementary to the positively charged quarternary N of ACh, has a higher affinity for 3,3-dimethylbutyl acetate, the carbon analogue of ACh, than for any other aliphatic ester (Metcalf *et al.* 1955).

Acetyl choline has been isolated and chemically and biochemically characterized from the central nervous system of the honey bee (Augustinsson and Grahn 1954), *Lucilia sericata* Meig. (Lewis 1953), and the house fly (Chefurka and Smallman 1956). The concentrations of ACh in insect central nervous tissue range from about 60γ per g. in the nerve cord of *Periplaneta americana*. L. to 500 γ per g. in the brain of *Calliphora erythrocephala*, with the house fly having a value of about 170 γ per g.

(Lewis and Smallman 1956). Calhoun (1958) has found the following values for ACh concentration in *P. americana*, in p.p.m.: thoracic connectives 31, ventral cord 63, abdominal ganglia 63, abdominal cord 65, thoracic cord 79, thoracic ganglia 95, brain 135. These concentrations are roughly about 50 times that of the mammalian brain in agreement with the correspondingly greater ChE activity of the insect nervous tissue. Elucidation of the physiological basis for such high concentrations of enzyme and substrate in the insect central nervous system remains a challenging problem.

In addition to the specific acetyl cholinesterase of insects, a nonspecific aliesterase is also present in the C.N.S. as well as a distinct aromatic esterase which is not inhibited by the organophosphorus toxicants and actually hydrolyzes materials such as parathion and para-oxon along with a variety of aromatic acetates. The normal functions of these enzymes are completely unknown and their discovery will be a most useful addition to our knowledge of insect biochemistry.

The enzymatic synthesis of ACh, involving the recently discovered processes of acetylation by coenzyme A has been investigated in insects by Smallman (1956) as a portion of his study of the lethal action of cholinesterase inhibitors. In *Lucilia sericata* (Meig.) the system involved the formation of acetyl coenzyme A from either citrate or acetate and ATP and subsequently the acetylation of choline by choline acetylase. The enzyme system was very similar in behavior to that in mammals although the activity in the insect tissues was among the highest yet reported, and synthesis of ACh occurred about 3 times as rapidly with acetate as citrate.

2. Lipoid Nerve Sheath.—Insect physiologists have long been puzzled at the apparent insensitivity of the insect organism to injected ACh as well as to other pharmacologically active substances such as curare, atropine and scopolamine. Roeder (1948) showed that acetyl choline at 10^{-2} M. caused neither discharge nor synaptic transmission when applied directly to the insect nerve. Tobias *et al.* (1946) and Hopf (1952) found that the injection of acetyl choline into the body cavity of *Periplaneta americana* L. and *Schistocerca migratoria* (L.) at doses as high as 10,000 mg./kg. had no effect, although the LD_{50} to the rat is about 250 mg./kg. Thus, a number of investigators have been led to question the essentiality of the ACh-ChE system in the nerve processes of insects. A clue to the answer of this problem was provided by Richards (1944) who showed that insect nerves are surrounded by a homogenous, non-cellular, elastic sheath, the neural lamella, which is structurally different from the protective coating of vertebrate nerves. Hoyle (1952) actually demonstrated the impermeability of this nerve sheath to ionized substances, such as potassium ions.

It remained for Twarog and Roeder (1956, 1957) to demonstrate that after mechanically desheathing the nerve cord of *Periplaneta americana* L., ACh at 10^{-4} M. produced a rapid asynchronous burst of action potentials followed by synaptic depression and block, and that this effect was heightened by eserine. The response to ACh was, however, not as sensitive as in the vertebrate nerve and it appears that there may be other ionic barriers to the penetration of ions into the synapse.

Winton *et al.* (1958) have provided histochemical evidence for the barrier of the lipoid sheath in *Periplaneta americana* L. to externally applied acetyl thiocholine by demonstrating that this substrate penetrates and is hydrolyzed by ChE only where a break in the sheath permits its entrance into the nerve cord.

3. Insect Eggs.—As early as 1943 Tahmisian investigated the autogenetic development of ChE in the eggs of *Melanoplus differentialis* (Thos.) and found the embryos contained a low level of enzyme in the prediapause state which remained relatively constant until the differentiation of the nervous system when it increased very rapidly. ACh could not be detected until the differentiation occurred. Despite the importance of this problem in the understanding of embryonic growth and organization little work was done until Lord and Potter (1951) investigated the ovicidal effect of TEPP upon the eggs of *Diatraxia oleracea* L. and *Ephestia kuhniella* Zell. It was found that if the insecticide were applied at high dosages some eggs were killed before visible embryonic development took place, but when applications were made at low dosages a high percentage of eggs developed to the highly formed embryo stage before death occurred. The authors concluded that at very high dosages TEPP could kill the eggs by inhibition of an esterase hydrolyzing *o*-nitrophenyl acetate. In a subsequent paper (Lord and Potter 1954) it was shown that cholinesterase activity did not appear in *D. oleracea* eggs until shortly before hatching while the enzyme hydrolyzing phenylacetate was present at all stages of development.

Smith and Wagenknecht (1956) investigated the ovicidal activity of parathion to eggs of the peach tree borer, *Sanninoidea exitiosa* (Say), and *Oncopeltus fasciatus* (Dall). The cholinesterase of the eggs showed substrate activity patterns indicative of the presence of specific acetyl cholinesterase and pseudocholinesterase, and, in the eggs of both species, cholinesterase activity appeared about the fourth day and rapidly increased to hatching. In contrast to the work of Lord and Potter, it was shown that exposure of the eggs of the peach tree borer to parathion at any stage in development resulted in cholinesterase inhibition in the later stages of development, which caused the death of the embryo, apparently from storage of the toxicant in the egg. Smith and Wagenknecht (1956) call attention to the commonly overlooked possibility that "ovicidal studies offer a unique approach to the matter of mode of action because the organism undergoes drastic developmental changes in which the enzymes in question are presumably not always present and if present may not yet enter into vital physiological functions."

V. SYSTEMIC INSECTICIDES

The first systemic insecticides to be used successfully for the inner therapy of plants were sodium selenate and bis-(2-fluoroethoxy)-acetal which when applied by watering about the roots of plants killed aphids and mites feeding on the leaves. However, neither of these materials was particularly suited for such application; and the practical commercial utilization of systemic insecticides followed after the discovery by Schrader and Kükenthal (1952) of dimefox and schradan. This ability to control insect pests of leaves and fruits by applications of chemicals to stem or roots has a particularly fascinating aspect and a vast amount of progress has been made which has been very completely reviewed by Bennett (1957) and Ripper (1957).

The development of practical systemic insecticides has afforded a number of new approaches to insect control, including seed and soil applications for the early protection of seedling plants, trunk and root applications for mature trees, ecologically selective insect control with consequent conservation of natural enemies, thorough treatment with limited coverage sprays, and in some cases reduction of the spread of plant viruses by controlling the insect vector. The wide variations in chemical properties and toxic action available from the various systemic compounds offers a range of treatments with effectiveness ranging over a period of a day or so with Phosdrin (XXIV) to an entire growing season with schradan. Considering the relative novelty of the systemic approach which was initially popularized by Ripper (1952) it is indeed remarkable that within a decade at least a dozen compounds have achieved commercial application on a world-wide basis (Table 1), while many more are undergoing development.

In this rapidly expanding field it is perhaps most significant that new developments and applications are constantly appearing. As an illustration, at this writing schradan, although its systemic properties have been

known since 1940, has just received its first registration under the Miller Bill for application to a food crop—walnuts. This application has provided a unique illustration of the potentialities of systemic insecticides for better insect control. Walnuts treated early in the spring when the foliage is immature remained virtually free of infestation by the walnut aphid, *Chromaphis juglandicola* (Kltb.), for an entire growing season, the trees held their foilage later in the fall than those with other treatments, and the leaves were greener, larger, and heavier. The depressing effect of the treatment was evident during the second season and it appears that for the first time it is possible to measure the full adverse effects of this aphid on the walnut tree (Michelbacher and Oatman 1955).

1. Seed Treatment.—The protection of young seedlings of plants such as cotton, alfalfa, sugar beets, cabbage, etc., from insect attack by application of insecticides as a seed coat or as a granular side dressing has only become possible with the development of highly persistent systemic insecticides such as Thimet and Di-Syston. This subject has been comprehensively reviewed by Reynolds (1958) who has pointed out that seed and soil applications of systemic insecticides provide (a) longer residual activity, (b) enhanced ecological selectivity, (c) better total coverage, and (d) reduction of hazard of handling toxic materials. Such treatments have the unique advantage of providing insurance against insect and mite attacks developing after the plant has started to grow. Treatment of cotton with 50% charcoal powder of Thimet at the rate of 1 lb. to 25 lbs. of seed has given protection against thrips, aphids, mites, and even chewing insects such as cutworms, beet army worm, and darkling ground beetles. Treatment of alfalfa seed with Di-Syston and Thimet at 1 lb. to 25 lbs. of seed, or the equivalent amount of 2 to 5% granular formulation broadcasted and incorporated into the soil with the seed provided up to ten weeks control of the spotted alfalfa aphid, *Therioaphis maculata* (Buck.), an insect whose feeding toxin often kills young stands of alfalfa. Sugar beet seedlings have similarly been protected from the attack of the beet leaf hopper, *Circulifer tenellus* (Baker), for 2 to 3 weeks and cabbage seedlings from the cabbage aphid, *Brevicoryne brassicae* (L.). Systox was generally less effective (Reynolds 1958).

Soil treatments after planting time using granular applications of Thimet and Di-Syston have shown considerable promise in controlling aphids and spider mites on many crops and for such specific problems as the flower thrips, *Frankliniella tritici* (Fitch), attacking cut flower crops. Of the newer systemic compounds, dimethoate (XXIII) shows especial promise for this type of application.

2. Trunk and Bark Applications.—The treatment of the basal portion of the stem or bark of trees has been shown to be a very useful means of rapidly applying systemic pesticides so as to protect the entire plant Jeppson *et al.* (1952) found that application of schradan to citrus tree trunks resulted in effective kills of the citrus red mite, *Metatetranychus citri* (McG.), on fruit and foliage, while Bond (1953) was able to kill *Planococcus kenyae* attacking coffee with dimefox by applying it to the scraped bark under an oiled silk band. The efficiency of absorption from these applications was impressive. Systox applied to the trunk of a mature citrus tree at 0.5 oz. per tree was of comparable effectiveness as an acaricide to the same rate of application as a foliar spray, and provided a nearly complete kill of mites feeding on the fruit for as long as 3 months. When the dosage was trebled, the protection lasted up to 6 months. The bark treatment was much superior to the application of an equal amount of Systox applied to the soil around the tree, and in this case even the 1.5 oz. dosage did not produce complete mortality (Jeppson *et al.* 1954). The bark applications to oranges and lemons was found to be most effective from March through August when translocation is obviously most active in contrast to spray treatment which was most effective from November through May when cool weather favored the persistence of the spray residue.

Hanna *et al.* (1955) have made a comprehensive study of the use of dimefox to control the mealybugs, *Pseudococcus njalensis*, *P. citri* (Risso), and *Ferrisia virgata* (Ckll.), attacking cocoa as vectors of the swollen shoot disease. It was found that dimefox introduced at the rate of 160–250 p.p.m. of the total tree weight into holes drilled into the base of the trunk was highly effective. The trunk application when confined to a single hole gave acceptable kills of the mealybugs only on branches directly above the hole, and 4 to 5 holes spaced evenly about the trunk gave much more uniform results. The trunk application method was about 10 times as efficient on a weight basis as the application of dimefox about the roots of the tree.

The useful results obtained by the simple method of trunk application are typical of the utility of systemic insecticides in general and demonstrate that a knowledge and appreciation of the behavior of suitable compounds can greatly simplify application techniques, e.g. in the citrus studies referred to, from elaborate mechanical monsters to the paint brush.

3. Animal Systemic Insecticides.—The successful development of systemic poisons which can be ingested or absorbed by domestic animals in quantities sufficient to kill cattle grubs, *Hypoderma bovis* (L.) and *H. lineatum* (DeVill.), without harmful results to the host has been one of the dramatic successes resulting from the development of the organophosphorus insecticides; and offers much promise for the control of these pests which cause damage estimated at more than $100,000,000 annually in the United States. As early as 1944 Lindquist *et al.* showed that bed bugs could be killed by feeding on rabbits fed 200–500 mg. per kg. of DDT or pyrethrins, and experiments with chlorinated hydrocarbon insecticides such as lindane, aldrin, and dieldrin also showed promise, but the accumulation of chlorinated hydrocarbon insecticides in animal fat has made their use impractical. The most promising results to date have been obtained from the oral application of Trolene, *O*,*O*-dimethyl *O*-2,4,5-trichlorophenyl phosphorothionate (XIX), as a bolus at 100 mg. per kg. of animal weight (McGregor and Bushland 1957), or of Co-Ral, *O*,*O*-diethyl *O*-(3-chloro-4-methyl-7-coumarinyl) phosphorothionate (XI, Cl), as a spray at 0.25 to 0.75% concentration. In addition to controlling cattle grubs, these treatments are effective against screwworm larvae, and for shorter periods against adult horn and stable flies and lice and ticks. Trolene has also demonstrated anthelminthic value. Effective control of internal parasites has also been obtained with horses and sheep. Because of the danger of toxic residues in meat, cattle should not be treated within 60 days of slaughtering with Trolene or 21 days with Co-Ral. Treatment of milk cows is not recommended within 60 days of lactation. A newer practical animal systemic is *O*-methyl *O*-(4-*tert*-butyl-2-chlorophenyl) methylphosphoroamidothionate which is effective at 20–25 mg. per kg. body weight orally or as a spray at 0.75% concentration (Anon. 1959).

In connection with the oral administration of animal systemic insecticides, Ahmed *et al.* (1958) have shown that bovine rumen fluid is active in metabolizing organophosphorus insecticides. The activity appears to be due to the microorganisms present which are much more effective in promoting reduction of organic compounds than oxidation. As an indication of the complexity of the reactions taking place with orally administered animal systemics, it was found that parathion is reduced in the rumen to *O*,*O*-diethyl *O*-*p*-aminophenyl phosphorothionate and that this compound, together with intact parathion, are oxidized in the liver to diethyl *p*-aminophenyl phosphate and to para-oxon. Hydrolysis also occurs and the urinary metabolites are diethyl phosphoric acid and diethyl phosphorothionic acid, together with the two amino compounds.

VI. SELECTIVE TOXICITY AND INSECT ECOLOGY

For many years it has been recognized that the greatest single factor in preventing insects from overwhelming the

rest of the world is the internecine warfare which they carry out among themselves. The entomophagous insects are generally inconspicuous and their absence is scarcely noticed until elimination by the ravages of climate or a blanket of insecticide allows their host species to increase suddenly toward its maximum biotic potential. Examples of this sort have been increasingly frequent as a result of the haphazard use of the highly toxic and persistent organic insecticides and familiar cases include the outbreaks of red spider mites (Tetranychidae) following applications of DDT, dieldrin, Sevin, etc., and cottony cushion scale, *Icerya purchasi* Mask., after drift of DDT and malathion. This subject has recently been reviewed by Ripper (1956) who lists about 50 species of economic importance in which resurgences have followed insecticidal applications. It is obvious that the most elegant use of insecticides lies in their selective use to conserve populations of beneficial insects and thus to create the environment for a joint chemical and biological attack on the pest species.

Ripper and coworkers (1950) were quick to appreciate the utility of the organophosphorus toxicants, with their great range of insecticidal properties, as selective insecticides, and called attention to the physiological selectivity of schradan which is virtually inactive as a contact insecticide to predators such as Coccinellidae, Syrphidae, and Chrysopidae, yet is highly toxic to aphids and spider mites. An interesting case of physiological selectivity is shown by the isopropyl analogue of parathion, *O,O*-diisopropyl *O*-*p*-nitrophenyl phosphorothionate, which was found to be about 100 times as toxic, on a weight basis, to the oriental fruitfly, *Dacus dorsalis* Hendel, as it was to its *Opius* parasites, although parathion was about equally toxic to both. The former compound was also relatively non-toxic to the honey bee (Metcalf 1958). Selective physiological toxicity has also been shown by the highly charged molecules *O,O*-diethyl *S*-ethyl-2-diethylamino phosphorothiolate hydrogen oxalate and *O,O*-diethyl *S*-ethyl-2-thioethyl phosphorothiolate methosulfate which appear to be relatively much more toxic upon ingestion after systemic absorption than by contact (Ripper 1957). Dylox or Dipterex, *O,O*-dimethyl 1-hydroxy-2,2,2-trichloroethylphosphonate (XXVII), is virtually nontoxic as a contact insecticide but highly effective as a stomach poison, since although intrinsically inactive it is converted in aqueous tissues to the violent poison DDVP, *O,O*-dimethyl *O*-2,2-dichlorovinyl phosphate (XXV) (Section II-1).

Unique selective action can be obtained by utilizing the individual chemical peculiarities of the organophosphorus insecticides. Thus, TEPP and Phosdrin (XXIV) provide high initial activity but very short-lived residual action because of their instability to aqueous hydrolysis. Phosdrin and dimefox (II) are also comparatively volatile, which contributes to short-term effectiveness. Systemics such as Systox are rapidly absorbed into plant tissues within one to several days and thus do not leave residues toxic to most predators, although they poison internal feeders ingesting the plant juices.

Applications to the soil with seed coatings or granular formulations of Thimet or Di-Syston (XV) provide an interesting way of introducing the toxicant through the plant roots, thus achieving selective toxicity as well as the safest possible means of handling toxic materials. This same principle of selectivity is effected by means of application to bark or trunk of mature trees as has been utilized with Systox for the control of the citrus red mite, *Metatetranychus citri* (McG.), and with dimefox for the mealybug vectors of the swollen shoot disease of cacao (Section V). Selectivity in these applications results from the presence of the toxicant entirely within the plant tissues where it is toxic to sucking pests and sometimes to chewing insects, but has not been effective on parasites and predators, excepting perhaps those which are partially phytophagous or who overindulge upon their freshly poisoned prey, a factor which is not serious because of the rapid detoxication of the organophosphorus compounds in the insect body.

Bait sprays, such as those used for fruitfly control, offer another avenue of selectivity, and their ultimate elegance of application lies in their use with selective attractants—not on edible produce where residue problems are acute, but on inert substrates as Steiner (1955) has done with parathion and methyl eugenol for the control of the male *Dacus dorsalis* Hendel.

The practical accomplishments of selective insecticides are already impressive. Ripper *et al.* (1950) showed that with plots infested with the strawberry aphid, *Pentatrichopus fragaefolii* (Ckll.), applications of schradan at 0.15—0.4% resulted in virtually complete control for 3 to 5 weeks, while with treatments with parathion and paraoxon at 0.015%, although good initial control was obtained, the aphid populations after 2 weeks rose to levels higher than those at pretreatment. Similar results were obtained with the cabbage aphid, *Brevicoryne brassicae* (L.), on brussel sprouts, and the hop aphid, *Phorodon humuli* (Schr.). In all cases the aphid populations treated with the non-selective insecticides returned to high levels much more quickly after treatment than those treated with schradan. Many other examples of this phenomenon can be cited, but the recent work of Stern and van den Bosch (1959) dealing with the control of the spotted alfalfa aphid, *Therioaphis maculata* (Buck.), is perhaps the most striking. This insect with its enormous reproductive potential is readily killed with parathion or malathion sprays but these also decimate the predator populations, so that as many as 8 applications at rates of 2 to 4 oz. per acre are necessary to achieve seasonal control. Careful surveys of the populations of such predators as *Hippodamia* spp., *Syrphidae*, *Chrysopa*, *Orius*, and *Geocoris* showed that Systox at 1 to 2 oz. per acre produced little change in these in comparison with check plots. The employment of Systox at 1 oz. per acre has consistently given control for several weeks although the control by parathion and malathion has failed within one week.

The use of insecticides in studying insect ecology is a very promising tool. From the foregoing discussion of selective toxicity it will be seen that the organophosphorus insecticides offer possibilities of almost any desired type of selective removal of host or predator with short or long term activity. Huffaker and Kennett (1953) have utilized parathion to study the influence of the predator *Typhlodromus reticulatus* (Oud.) upon the population dynamics of the cyclamen mite, *Tarsonemus pallidus* (Banks). TEPP was so short-lived as to permit the predator populations to recover repeatedly and thus frequent applications were necessary to keep the predator population at a low level. TEPP also did not penetrate well enough into the well protected areas of the plant where the predators were found. Parathion, however, was the most effective material evaluated and three applications in April, July and November in the greenhouse virtually eliminated the predator populations, allowing the investigators to ascertain that in their absence, the cyclamen mite population rose to peak levels, and that low level populations of the predator consistently controlled the pest.

VII. INSECT RESISTANCE TO INSECTICIDES

No survey of progress in the field of insect control can be complete without a discussion of acquired resistance by the pest species. This situation with regard to the organophosphorus toxicants is perhaps a little brighter than in the case of the chlorinated hydrocarbon pesticides, if only because of the far greater variety of toxicants available.

Early laboratory experiments using parathion as the selective agent for *Musca domestica* L. showed that resistance in susceptible flies developed very slowly as compared to DDT or lindane and apparently reached a ceiling level of 5 to 10 times beyond which it did not increase further, even after selection of larvae and adults for over 200 generations. The selected strain was, however, inexplicably over 3000 times resistant to DDT and dieldrin (March, Lewallen, and Metcalf 1956). Similar results were obtained by selection with diazinon which resulted in 5 to

10 times resistance after 30 generations, DFP where resistance increased 15 times in 100 generations, para-oxon—10 times in 40 generations, Dipterex—8 times in 12 generations, and DDVP—8 times in 8 generations. With other organophosphorus insecticides, such as Chlorthion, *O,O*-dimethyl *O*-3-chloro-4-nitrophenyl phosphorothionate (XVIII, Cl-3), the increase in resistance was more dramatic and a level of 60 times was reached after 39 generations (Brown 1958a).

In actual field usage where selection is made from house fly strains already highly resistant to the chlorinated hydrocarbons such as DDT, lindane, chlordane, and dieldrin, the continued use of organophosphorus insecticides resulted in 2 to 3 times resistance to parathion, 3 to 15 to Diazinon (XII), and 8 to 45 times to Resitox or Co-Ral (XI-Cl). Malathion resistance of 32 to 37 times normal has appeared in Florida and California, and diazinon resistance of 5 to 60 times in Italy, Switzerland, and Egypt (Brown 1958b).

With a number of species of spider mites in orchard, field, and greenhouse very serious resistance to the organophosphorus insecticides has occurred with parathion, malathion, and Systox, involving *Metatetranychus ulmi* (Koch), *Tetranychus bimaculatus*, *T. urticae*, *T. atlanticus* McG., *T. pacificus* McG., *T. mcdanieli*, and *Metatetranychus citri* (McG), as well as other species. There is also evidence that parathion resistance has appeared in several species of aphids, including the walnut aphid, *Chromaphis juglandicola*, the cotton aphid, *Aphis gossypii* Glover, the green peach aphid, *Myzus persicae* (Sulz.), and the spotted alfalfa aphid *Therioaphis maculata* (Buck.) (Brown 1958b).

The cross tolerance of these organophosphorus resistant species to other insecticides of this group is of considerable importance. The available data shows that cross resistance is not necessarily widespread among the available organophosphorus insecticides. Thus, malathion-resistant house flies are susceptible to parathion; Dipterex- and Chlorthion-resistant flies are susceptible to parathion and the Chlorthion-resistant flies are susceptible to dicapthon (Brown 1958a). With the spider mites all degrees of tolerance and susceptibility seem to exist. The European red mite populations resistant to parathion were also resistant to malathion in one area but not in another and were controlled by EPN (XXX). The parathion resistant *T. bimaculatus* mites in greenhouses extended to some degree to a number of organophosphorus compounds, but these could be controlled by TEPP, sulfotepp or tetraethyl dithionopyrophosphate (VII), and Systox. In contrast, parathion resistance in *T. urticae* extended to all other organophosphorus compounds tested. Similar results have been obtained with parathion and Systox resistance in *M. citri* which was found to extend to a number of other commercially available phosphates, but as shown by the following ratios of R/S at LC_{50} was quite variable as to intensity: Trithion 15,000, Systox thiol-isomer 8,570, Methyl Systox 8,000, schradan 2,000, EPN 1,400, parathion 883, Phosdrin 350, Amiton 111, Delnav (XXXII) 100, diazinon 12, and malathion 8 (Jeppson *et al.* 1958).

The above data, together with the available physiological and biochemical information, suggest that organophosphorus resistance is the result of either increased rates of detoxication or decreased rates of penetration, or perhaps both factors operating together. This fertile field deserves much additional study with the hope of contributing useful means of control of the resistant species and the certainty of increasing our basic knowledge in the field of insect biochemistry.

VIII. MEDICINE

The widespread utilization of the organophosphorus insecticides in agriculture has resulted in occasional cases of careless human misuse with consequent violent illness and sometimes death. The threat of nerve gas warfare and the existence of large quantities of these agents poses a similar problem on a vastly magnified scale. Consequently, it has been important for the medical profession to become acquainted with the symptoms and therapy of anticholinesterase poisoning. Typical symptoms of intoxication by any of these agents include:

(a) Muscarinic effects.—Nausea, vomiting, abdominal cramps, diarrhea, increased salivation, sweating, lacrimation, and blood pressure; excessive bronchial secretion and pulmonary edema, myosis and blurring of vision; and tenesmus, involuntary defecation, and micturation.

(b) Nicotinic effects.—Muscular fasciculations of eyelids, tongue, face, neck, and body; generalized muscular weakness and cramps.

(c) Central nervous system.—Giddiness, anxiety, tremulousness, headache, insomnia, nightmares, speech difficulty, confusion, coma, and convulsions.

All of these symptoms arise from the intense stimulation of the autonomic nervous system occurring as a result of the process of ChE inhibition (Section III-1), and the consequent accumulation of acetyl choline at parasympathetic postganglionic fibers (muscarinic action), at synapses between preganglionic and postganglionic fibers of both sympathetic and parasympathetic neurones (nicotinic action), at the myoneural junctions of striated muscle (nicotinic action), and in the central nervous system. Differences in the relative intensities and durations of these symptoms, as well as the degree of involvement of peripheral or central nervous system, are observed with the various toxicants and are the result of differences in the stability, specific reactivity, and solubility of the compounds in various tissues and organs. Thus, compounds partitioning predominantly in lipoids produce central symptoms while those largely water-partitioning cause peripheral activity. The rates of reactivation of the inhibited ChE also vary with chemical structure and are fairly rapid for methyl esters and much slower for isopropyl esters (Section III-1).

The organophosphorus toxicants may enter the body by ingestion, by inhalation of dusts or vapors, or dermally. Absorption by the latter method is surprisingly efficient, the dermal (percutaneous) LD_{50} value generally not exceeding ten times the oral LD_{50} in mg. per kg. as shown below:

	Oral	*Percutaneous*
Parathion	6–15	40–50
TEPP	1–2	5
Systox	9	24

Atropine is a specific antidote for poisoning by all the organophosphorus anticholinesterases and its prompt application has saved a number of lives in cases of accidental poisoning. Its specific action seems to be to compete with ACh at the receptor sites in the synapses. Other antidotes which have been found effective, usually in combination with atropine, are scopalamine *n*-butyl bromide, panparnit, and the nucleophilic reagent 2-pyridine aldoxime methiodide or PAM (Section III-1). Curare (*d*-tubocurarine) has been found to antagonize the nicotinic symptoms (muscular fasciculations) of the anticholinesterase by occupying the normal ACh receptor sites on the motor end plates (Saunders 1957).

A sensitive indicator of the absorption of the anticholinesterase drugs is provided by the ChE enzymes of red blood cells (specific ChE) and plasma (pseudo ChE). Detailed experience has shown that the plasma ChE activity can be depressed nearly to 0%, and the r.b.c. ChE activity to about 15% of normal, without the occurrence of any of the neurotoxic symptoms mentioned above. Measurement of ChE levels in both plasma and red cells has, therefore, become a standard clinical test for the determination of harmful exposure to the organophosphorus toxicants. A depression of normal plasma ChE values below 75% of normal in an individual working with an organophosphorus insecticide may be taken as evidence of recent bodily absorption of the toxicant (Hamblin and Golz 1953).

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After severe organophosphorus poisoning, e.g. with parathion, approximately 30 days was required for plasma ChE and 90 days for red cell ChE to return to normal pre-exposure levels (Grob *et al.* 1950). The rate of regenertion of red cell and central nervous system ChE is about equivalent to the time required for the synthesis of new enzyme by the body. Therefore, chronic poisoning by bodily absorption of the organophosphorus insecticides may steadily lower specific ChE levels until an individual is at the threshold of severe poisoning and he may be precipitated into this condition by a fraction of a normal lethal dosage. For this reason, it is considered important to regularly determine blood ChE levels in spray operators and factory workers who regularly handle these toxic compounds. Corrective measures to eliminate exposure should be taken for any individual whose enzyme activity levels show a marked depression.

1. Organophosphorus Compounds as Therapeutants.—Before the discovery of the organophosphorus anticholinesterases, the only pharmaceuticals with cholinergic action were: the acetyl choline derivatives, acetyl-β-methyl choline, carbamoyl choline; physostigmine, or eserine, the alkaloid from the calabar bean (*Physostigma venenosum*), its synthetic analogue prostigmine, and other related synthetic carbamates; and the naturally occurring alkaloids—nicotine, muscarine (from the fungus *Amanita muscaria*), and pilocarpine (from *Pilocarpus* spp.). All of these substances are either directly stimulatory to the ACh receptors or are competitive inhibitors of ChE, and thus their activity is considerably more transitory than that of the irreversible phosphorylating inhibitors. Prostigmine and physostigmine have long been used for the treatment of glaucoma, a disease of the eye marked by an increase in intraocular pressure with consequent hardness of the eye, atrophy of the retina, and cupping of the optic disk, which may cause blindness. DFP instilled in the conjunctival sac at a concentration of 0.1% in peanut oil was found to be superior to 1% physostigmine and 5% prostigmine in the treatment of this condition, by lowering intraocular pressure which apparently has some relation to the ACh-ChE mechanism (Saunders 1957). Para-oxon (IX), or Minticol, is used in Europe for the treatment of glaucoma as eye drops at concentration of 0.016%, and is superior to DFP for the treatment of glaucoma because it can be applied in aqueous solution (Augustinnson 1953). The extremely powerful anticholinesterase *O*-ethyl *O*-*p*-nitrophenyl ethylphosphonate or Armin (ethylphosphonate of XXIX) has been used in the U.S.S.R. for the treatment of glaucoma since 1956 (Razumov 1957).

Myasthenia gravis is a debilitating condition characterized by fatigue, exhaustion, and progressive paralysis of the muscular system. It results from an excessive ChE activity which reduces ACh levels below the threshold required for normal function and activity. The administration of prostigmine is the classical remedy and results in dramatic but transitory recovery. Although DFP administered intramuscularly was less effective than prostigmine in relieving the symptoms of myasthenia gravis, octamethyl pyrophosphoramide or schradan has proved especially useful because of its inability to pass the blood brain barrier into the central nervous system. Its effects are, therefore, largely confined to the peripheral nervous system. In the U.S.S.R. Armin (XXIX) has proved very effective in the treatment of this disease (Razumov 1957).

Post-operative paralytic ileus, a paralysis of peristalis in the gut resulting from surgical shock, has been classically treated with prostigmine. DFP by intramuscular injection has proved superior (Saunders 1957).

To date there appears to have been no really systematic exploration of the suitability of the various organophosphorus anticholinesterases as therapeutants, comparable to the investigations of their use for insecticides and antipersonnel agents. Because of the unique range of properties and activities available, such an inquiry should be highly rewarding in terms of the development of new therapeutic agents.

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AUTOGRAPHA OO

(Continued from Inside Front Cover)

memorable event. The dates are November 30–December 3 at the Sheraton-Cadillac Hotel. You should plan to be there. Please see under MEETINGS for further information.

11TH INTERNATIONAL CONGRESS. We made reference to this event on page 78 of the October 1958 BULLETIN. We attempted to give the address of the Congress Secretary in German to facilitate the mail. Perhaps the editor was thirsty—in any case we wrote Wein for Vienna instead of the correct Wien. The eagle eye of the Eastern Branch Secretary caught us with our German down. We hope you are planning to attend this Congress. Transportation-wise it will pay you to organize in groups of at least 15. Now to try again (in English!). The XIth International Congress of Entomology will be held on August 17–25, 1960 in Vienna, Austria. You may write

DR. MAX BEIER,
Secretary General
c/o Naturhistorisches Museum
Vienna I, Burgring 7, Austria

AIBS. As announced elsewhere in this issue the Entomological Society of America is now a member of the American Institute of Biological Sciences. We hope you like the *AIBS Bulletin* which goes to all of our Active, Life, Emeritus and Honorary Members.

QUATRO REUNION LATINOAMERICANO DE FITOTECNIA

This meeting, which was composed of scientists from all fields dealing with plants, took place in Santiago, the capital city of Chile from November 24 to December 6, 1958. It was attended by more than 300 professional people of whom some 40 were entomologists.

Six days were devoted to paper reading and lecture sessions while the others were occupied by field trips to different sections of Chile. These trips were organized on a basis of crop interests rather than along professional lines.

The entomological section meetings were devoted to paper reading and discussion, they were lively, and interesting with considerable give and take among the participants.

Due to the fact that most spray chemicals must be imported and paid for at a ruinous rate of exchange, there is great interest in biological control. There have been some successes in this field and much experimental work is being done. Due to the small amounts of insecticides needed, there is also much interest in seed treatments. This is evident in both field and laboratory work. However, despite the high cost of spray chemicals, entomologists working in this field believe that their use is justified and that the amounts used are increasing from year to year.

The next reunion will be held in Buenos Aires probably in 1961.

C. R. CUTRIGHT
E. S. A. Delegate

MINUTES OF THE OPENING SESSION, PRELIMINARY BUSINESS MEETING AND FINAL BUSINESS MEETING SIXTH ANNUAL MEETING—ENTOMOLOGICAL SOCIETY OF AMERICA

SALT LAKE CITY, UTAH—DECEMBER 1–4, 1958

OPENING SESSION

December 1, 1958

The meeting was called to order at 9:00 A.M. by President R. L. Metcalf in the Lafayette Ballroom of the Hotel Utah. President Metcalf introduced George F. Knowlton, Chairman of the *Local Arrangements Committee*. Dr. Knowlton introduced the Honorable George D. Clyde, Governor of Utah who gave the Address of Welcome. The Governor's friendly and pertinent remarks were enjoyed by the more than 400 members and guests in attendance.

Preliminary announcements in regard to the meeting were made by the Executive Secretary, R. H. Nelson, and the Chairman of the *Program Committee*, L. D. Anderson.

President-Elect P. W. Oman then took the chair and introduced President Metcalf, who delivered the presidential address, *Organophosphorus Insecticides; Their Applications to Applied and Fundamental Research*. This timely presentation is printed beginning on page 3 of this issue of the BULLETIN. Dr. Oman complimented President Metcalf on his brilliant address. A 10 minute recess was declared.

President Metcalf again called the meeting to order and introduced Dr. Fred L. Soper of the World Health Organization who presented the invitation paper, *World Wide Malaria Eradication: Progress Report*. President Metcalf commented upon Dr. Soper's most encouraging remarks as to the possibility of the world finally being free of the ancient and once nearly universal malady of malaria.

President Metcalf then noted the end of the Opening Session.

PRELIMINARY BUSINESS MEETING

December 1, 1958

The Preliminary Business session was called to order by President Metcalf immediately upon the ending of the Opening Session. He called for the report of the Executive Secretary.

1. REPORT OF THE EXECUTIVE SECRETARY

a. *Finances.* Highlights of the activities of the Washington office since the fifth annual meeting in Memphis, Tennessee are presented for your information.

The Auditor's Report giving a complete story on the Society's funds will be printed in the March 1959 BULLETIN. The following summary for the past year may be of interest.

General Fund—Increase for the year	$ 391.16
Permanent Fund—Increase for the year	1,080.42
Thomas Say Foundation—Increase for the year	407.23

b. *Membership.*

CLASS	SEPTEMBER 1957	SEPTEMBER 1958
Active	3627	3747
Emeritus	58	66
Honorary	9	10
Life	68	68
Student	327	303
TOTALS	4089	4194
NET GAIN		105

c. *Annals of the Entomological Society of America.*

Dr. Hussey has put in his first year as Editor and deserves the thanks of the membership. We are happy to note that all issues of the ANNALS during the year were mailed out in the indicated month of issue. The following data apply to the September issue.

YEAR	COPIES PRINTED	COPIES MAILED
1957	2,100	1,842
1958	2,200	1,929

d. *Journal of Economic Entomology.*

Dr. Poos, who is also Editorial Assistant in the Executive Secretary's office, continued his excellent work with the JOURNAL. A public acknowledgement of the assistance of Mrs. Poos is in order. The following data apply to the October issue.

YEAR	COPIES PRINTED	COPIES MAILED
1957	5,700	5,271
1958	6,000	5,269

e. *Index to the Literature of American Economic Entomology.*

There was no issue of the INDEX in 1958. Volume XVI is planned for early in 1959. It will cover the literature for 1956 and 1957.

f. *Annual Review of Entomology.*

These excellent annual volumes are taking a deserved place in entomological libraries. We hope our members will continue to purchase copies each year. We suggest your placing a standing order with the Washington office to insure the receipt of each volume as printed. Standing orders are suggested to avoid missing an issue.

g. *Election results.*

Mr. M. P. Jones was elected as President-Elect for 1959 and will become President in 1960. Dr. E. A. Steinhaus (Section C) and Dr. Roy Hansberry (Section F) were elected to the Governing Board. Professor E. O. Essig and Dr. W. C. O'Kane were elected to Honorary Membership in the Society. The elevation of M. P. Jones to President-Elect in 1959 will result in R. W. Sherman becoming Section E Representative on the Board. The Eastern Branch elected Neely Turner to the Governing Board.

In the special measures voting [see the BULLETIN 4(3):113–114] the increase in dues by $3.00 (i.e., from $10.00 to $13.00) carried; joining the AIBS carried; while the collection of $1.00 to be refunded to the Branches lost. We will become a Member Society in AIBS as of January 1, 1959.

2. REPORT OF THE PRESIDENT

President Metcalf presented as his report the summarization of the information gained from the membership by the questionnaire on the annual meeting and related material. This questionnaire went to all members in 1958. The report will be published in the June 1959 BULLETIN.

3. ANNOUNCEMENTS

The Executive Secretary announced that the final business meeting would be held following the L. O. Howard Memorial Lecture on Wednesday afternoon, December 3, as noted in the program. By Governing Board authority he also gave notice to the membership that at the final business meeting their approval would be asked for the possible use of money from the Permanent Fund for the initial payment on a headquarters building for the Society.

4. Recess

The meeting adjourned at 12:00 Noon to reconvene immediately following the L. O. Howard Memorial Lecture on December 3.

FINAL BUSINESS MEETING
December 3, 1958

The meeting was called to order at 3:00 P.M. by President Metcalf. The meeting followed the delivery of the most scholarly L. O. Howard Memorial Lecture, *Metamorphosis: A Tool for the Study of Growth* by Dr. Carroll M. Williams. There were over 400 members present.

1. Preliminary Announcements

Preliminary announcements were made by the Executive Secretary. The new officers of the Sections and Sub-Sections were asked to meet with the new Chairman of the *Program Committee* at the end of the business meeting. Congratulations were extended to L. D. Anderson, Chairman of the 1958 *Program Committee* for the excellent 1958 program and thanks to his secretary, Charlotte Donlevy, for her help.

President Metcalf stated that as instructed by the Governing Board at Memphis, a parliamentarian had been appointed. He introduced Dr. William M. Rogoff who had agreed to act in this capacity. The Executive Secretary was asked to give a summary of the actions of the Governing Board at the Salt Lake City meetings.

2. Governing Board Actions

The principal actions taken by the Governing Board since their meetings started on November 30 were summarized as follows by the Executive Secretary.

a. The Board selected the Hotel McAllister in Miami, Florida for the November 27–30, 1961 meeting of the Society. As had been announced at Memphis, the November 30–December 3, 1959 meeting will be held at the Sheraton-Cadillac Hotel in Detroit, Michigan and the November 28–December 1, 1960 meeting at the Chalfonte-Haddon Hall in Atlantic City, New Jersey.

   The 1959 meeting will be a joint meeting with the Entomological Society of Canada and the Entomological Society of Ontario. This should be an outstanding event. The 1962 meeting will again be in the west, probably in the Pacific Northwest.

b. A budget for the Fiscal Year 1959 of $132,600.00 estimated receipts and disbursements was approved.

c. The list of 14 members whose applications for Emeritus membership had been approved by the Board was read. These members were G. G. Becker, W. C. Dutton, J. Allan Hall, J. Douglas Hood, Ralph L. Parker, Roy M. Sallee, Herman A. Scullen, Claude Wakeland, Willard W. Yates, C. L. Fluke, Roger B. Friend, A. M. Massee, T. H. Parks and Roger C. Smith.

d. There were 334 applications for student and active membership received since the Memphis meeting. These applicants were approved by the Governing Board. The register containing the names of these new members was displayed and was available for examination.

e. The Executive Secretary commented upon the reports of the various Standing Committees, Editorial Boards, Society Representatives and Special Committees. (These are printed in this issue of the Bulletin along with the actions of the Governing Board) The great amount of work done by the many members who worked on these various committees was noted by the Secretary. Careful reading of the reports and of Governing Board actions was recommended.

f. The Governing Board implemented the inauguration of the new publication, Miscellaneous Publications of The Entomological Society of America by authorizing the Sections to elect members of an Editorial Board for his publication.

g. The position of Managing Editor was created. The incumbent is to be a full time Society employee in the office of the Executive Secretary. The Board offered this position to Dr. F. W. Poos and persuaded him to accept.

h. Rules for the guidance of the *Program Committee* were adopted and are to be printed in the March 1959 issue of the Bulletin.

i. Membership cards for Society members were authorized and will be issued once to each member. Initial distribution will be in 1959.

j. A Building Fund was established. Contributions and similar funds will be deposited in this Fund. See the report of the *Finance Committee* and resulting Board action.

k. Certain other actions of the Board are to be separately discussed.

3. The Executive Secretary expressed his personal thanks to his office staff for their efforts in behalf of the Society under the direction of Mrs. Louise B. Stone. Thanks were also extended to the Governing Board for sympathetic understanding. The completion of the terms of H. M. Armitage, C. P. Clausen, F. W. Fletcher and B. B. Pepper on the Governing Board were noted with regret. The Executive Secretary then expressed his personal thanks and regards to the 1958 President, R. L. Metcalf.

4. The Salt Lake City meeting was announced as the second largest of the Society, the registration being 679.

5. President Metcalf requested the Executive Secretary to read the Governing Board nominations for vacancies on Standing Committees. In each case nominations were called for from the floor. There were none. The nominees as listed here were unanimously elected by the members in attendance.

   Program Committee. R. W. Sherman.
   Membership Committee. J. M. Grayson, A. C. Gunter.
   Committee on Entomological Nomenclature. C. W. Sabrosky, G. P. Holland, R. L. Usinger.
   Committee on Common Names of Insects. H. E. Evans, F. D. Miner.
   Committee on Insecticide Terminology. R. B. March, Carroll N. Smith.
   Committee on Insecticide Reference Standards. Rosemarie von Rümker.
   Committee on Insect Surveys. E. W. Beck, O. H. Hammer.
   Committee on Finance. J. V. Osmun.
   Committee on Professional Training, Standards and Status. D. R. Lindsay, R. E. Heal.

6. The Executive Secretary read the list of Chairmen of Standing Committees as designated by the Governing Board.

   Program Committee. Edward H. Smith.
   Membership Committee. W. G. Eden.
   Committee on Entomological Nomenclature. R. L. Usinger
   Committee on Common Names of Insects. J. L. Laffoon.
   Committee on Insecticide Terminology. Carroll N. Smith.
   Committee on Insecticide Reference Standards. G. F. Ludvik.
   Committee on Insect Surveys. C. A. Bower.
   Committee on Finance. J. E. Bussart.
   Committee on Professional Training, Standards and Status. S. B. Freeborn.

7. President Metcalf called for further old business. There was none. He then announced the consideration of new business.

8. The President commented upon the problem of amending the Constitution which arose at the Memphis

meeting, most of the difficulty being various interpretations of Article XII of the Constitution. He announced that he had requested Col. R. W. Bunn to make a survey of the constitutions of various scientific societies and to report at the Salt Lake City meeting. Col. Bunn then reported that he had made a survey as requested by the President and had prepared a proposed amendment of Section XII of the present Constitution. This proposed amendment, which would reword the present Section XII if adopted, was then presented to the annual meeting by Col. Bunn. The proposed amendment was as follows.

ENTOMOLOGICAL SOCIETY OF AMERICA

CONSTITUTION

ARTICLE XII

Amendments

Section 1. Any proposal for amendment or amendments shall first be submitted in writing to the Executive Secretary of the Society over the signature of a majority of the Governing Board or of fifty or more voting MEMBERS of the Society. Such proposals must be submitted to the Executive Secretary at least four months before the annual meeting at which action thereon is to be taken.

Section 2. The Executive Secretary shall arrange for proposals for amendment to be printed in an issue of the BULLETIN appearing at least 30 days before the annual meeting at which action thereon is to be taken.

Section 3. The Governing Board shall consider all proposals for amendment or amendments and develop recommendations with respect thereto to present to the members at the annual meeting.

Section 4. Proposals to amend, duly made in the above manner shall be laid before the members of the Society at an annual business meeting for discussion and vote. The recommendations of the Governing Board concerning such proposals shall be duly considered.

Section 5. If a proposed amendment is approved by a two-thirds vote of the members present, it shall be printed in the next possible issue of the BULLETIN together with the reason for the proposed amendment and the recommendations of the Governing Board concerning its passage. A mail ballot to the entire voting membership shall then be taken, not less than 30 days after appearing in the BULLETIN.

Section 6. The President shall name a special committee of three members to canvass the ballots one of whom shall be the Executive Secretary. Six weeks after distribution of the ballot, this committee shall tabulate all votes received and inform the President and the Members through the BULLETIN of the results of the ballot. No amendment shall be ratified unless two-thirds of the Members voting on the proposal vote in its favor.

Section 7. Amendments are effective as of the date of ratification unless otherwise specified.

Col. Bunn moved the adoption of his proposed amendment and that the Society proceed with the amendment in accordance with Article XII of the present Constitution. The motion was seconded from the floor. Discussion was called for. The parliamentarian suggested the reading of the present Article XII. This was read by President Metcalf. The President stated that he proposed to act in accordance with the second sentence of Article XII and appoint a committee to consider the amendment proposed by Col. Bunn. This committee would report its recommendations at the Detroit meeting in 1959. The President asked the Executive Secretary to read the Governing Board recommendation. The recommendation, as follows, was read.

"The Governing Board recommends to the Society that an amendment to Article XII, which will be presented by Col. Bunn, be considered and acted upon at the annual meeting and that no other amendments be considered until the proposed amended Article XII becomes effected."

In reply to questions from the floor the President suggested that comments on the proposed amendment be made to the *Amendment Committee*. The motion was then put to a vote and carried unanimously. The President appointed the committee with instructions to report at Detroit. The committee members named by the President were: C. C. Alexander, William M. Bickley, and B. A. Porter, *Chairman*.

9. President Metcalf then discussed the space problems at the Washington office. The Governing Board had set up the position of Managing Editor, a full time job, and had persuaded Dr. F. W. Poos to accept this position. He was reluctant to accept because of very crowded quarters and no space for an editorial assistant. The Society needs to look for larger quarters for the central office

The President stated that this matter of a central office had been thoroughly discussed by the Governing Board. Incoming President Oman has been authorized to appoint a committee of Governing Board members to make a careful study of the matter of a permanent home for the Society and to report to the full Board as soon as possible. The President further asked the Executive Secretary to read the Board's recommendation in regard to funds for this matter. The Executive Secretary referred to the announcement made at the preliminary business meeting that at the final business meeting approval of the membership for the possible use of money from the Permanent Fund would be asked. He then read the regularly adopted action of the Governing Board as follows.

"It was regularly moved, seconded and passed at the meeting of the Governing Board that the membership at the final business meeting at Salt Lake City be asked to approve the possible use of up to $25,000.00 of the Permanent Fund for acquisition of a permanent Society headquarters."

The President called for discussion of the matter. A motion was made by W. W. Middlekauf that the meeting approve the request of the Governing Board. Seconded by A. W. Woodrow. The President called for discussion.

R. E. Campbell asked that if suitable headquarters were found would the $25,000.00 be spent without further discussion. The Secretary replied that President Oman is appointing a committee to consider this and the decision of the committee will regulate what is finally decided. He added that the committee is authorized to go ahead and make whatever arrangements are felt necessary. Dr. Oman took the floor and said his understanding of functions of committee is they are to explore, not make definite decision but if they feel favorable they will bring it to the attention of the Board at once.

President Metcalf stated that the Board this year authorized George L. Hutton to make a study of housing in the Washington area.

Mr. Hutton told the group that the question of maintenance costs was discussed with realty companies in Washington and that from $750.00 to $1500.00 per year for janitorial services was estimated with other maintenance costs in addition.

The President then said Mr. Hutton had made a thorough study and prepared diagrams illustrating the situation in full. It was brought out that the $25,000.00 would be a down-payment, not the entire expected purchase price and that there are various ways of accumulating the balance which will be explored. This

situation is looked upon in the same way as buying one's own home.

Then it was suggested that Mr. Hutton present the main features of his report to the meeting. (See full report elsewhere in this issue of the BULLETIN.) He discussed the possibility of some interest in the old Marlatt estate to be dedicated as a Memorial but felt this could be deleted as a possibility as there is no indication of the present heirs' interest in entomology. Rental and long term lease possibilities were investigated. Much additional storage space required which would cost $1,000.00 to $2,000.00 yearly. The Society is not empowered to use present funds in lease arrangements. The AIBS is interested in a headquarters building and offered space on straight rental basis, but the proposition seems to be beyond the Society's consideration. The last possibility was an interview with three different realtors in downtown area who are handling other Societies going into permanent quarters. Mr. Hutton states he felt we should take the same attitude as in buying our own homes. The Society can figure a cost of somewhere between $40,000.00 and $60,000.00. The President asked for further discussion.

M.P. Jones asked if this group has the power to commit the $25,000.00 of ESA funds, and if down payment permitted unlimited amount in purchase of headquarters. Col. Bunn stated it seems logical to obtain options and so empower the Governing Board.

The Executive Secretary explained the Permanent Fund, now about $31,000.00, and said the principal cannot be disturbed without the permission of the membership. He read Article VIII of the Constitution which governs the Permanent Fund. He said the main purpose is to give the Committee some money this year if they need it.

E. H. Smith asked why the only site considered was Washington. The Chair asked Mr. Hutton to explain the reasons. Mr. Hutton said preliminary sampling of opinion was made as to whether or not the Washington area was desirable and each member of Board was asked to approve. He then read from his report which stated the center of considerable federal and commercial interest in entomology is in Washington; center of similar scientific organizations; center of many Federal agencies whose decisions affect the future of entomology and these specific concepts on which recommendation was base.

Walter Carter offered the thought that the longer the matter is left, the more it will cost and stated he would like to see the motion passed. Chair then called for motion to be read again.

The Executive Secretary re-read the motion and the Governing Board request. A vote was called for and the motion carried unanimously.

10. The Chair announced that in regard to finances, the Governing Board decided to appoint a Managing Editor. $16,000.00 was approved to be spent for editorial purposes during the current year. All this is covered in the current budget. Also the Governing Board authorized a modest increase in the salary of Executive Secretary Nelson.

11. The President announced that the Society was invited by the National Agricultural Chemical Association to serve as a co-sponsor of a two-day symposium on insecticide resistance with expenses to be paid by NACA. This is now being organized and it is hoped it can be held in Washington some time next year. Proceedings will be published in book form.

12. Next, the President called for the report of the *Resolutions Committee.*

Resolution #1. WHEREAS the Society has lost a number of members by death since the last annual meeting,

BE IT RESOLVED, that this Society which through its Executive Secretary has extended sympathy to the families of the members, further show its respect by a reading of the roll.

Orlando S. Bare
Ernest G. Beinhart
C. L. Burkholder
Seth B. Capp, *Life Member*
T. R. Chamberlin
J. M. Davis
G. F. Ferris
H. J. Franklin, *Emeritus Member*
Donald H. Groves
Frederick Z. Hartzell
H. E. Hodgkiss, *Emeritus Member*
Morris Katzman
H. S. McConnell
H. B. McGahan
Thomas B. McGuire
A. L. Quaintance, *Emeritus Member, Charter Member, Past President*
Arthur L. Reid
Alan J. Ross
Lester L. Spessard

Resolution #2. WHEREAS the Executive Secretary, Mr. R. H. Nelson and staff have fulfilled their duties in a very commendable manner,

BE IT RESOLVED, that thanks be expressed by the Society to Mr. Nelson, to Dr. Poos and to others of his staff for a job well done.

Resolution #3. WHEREAS the *Program Committee,* consisting of E. N. Woodbury, E. H. Smith and L. D. Anderson, Chairman, has prepared and conducted an excellent program involving an enormous amount of work and judgment,

BE IT RESOLVED that the Society express its thanks to the Program Committee for its major contribution.

Resolution #4. WHEREAS the *Local Arrangements Committee,* George F. Knowlton, Chairman, has discharged its duties in an excellent manner, including excellent hotel facilities, banquet and entertainment,

BE IT RESOLVED that the Society acknowledge the committee's work with deep appreciation.

Resolution #5. WHEREAS the *Ladies Entertainment Committee,* Mrs. George F. Knowlton and Mrs. D. M. Rees, Co-Chairmen, has provided a very enjoyable time for wives of entomologists attending the sixth annual meeting,

BE IT RESOVED that the Executive Secretary prepare a letter of appreciation to the members of the committee.

Resolution #6. WHEREAS the *Exhibits Committee,* under the chairmanship of A. D. Hess, has provided for excellent displays, not only to the membership but to hotel visitors as well,

BE IT RESOLVED that the Society express its deep appreciation.

Resolution #7. WHEREAS the Photographic Salon, under the leadership of L. R. Brown, J. C. Chamberlin and W. P. Nye has been an outstanding success,

BE IT RESOLVED that the contribution of this new aspect of the meetings be duly acknowledged, both to the Committee and to the entomologists who contributed to it.

Resolution #8. WHEREAS the news releases covering these meetings, to the press, radio and TV have been very favorable and extensive, principally through the efforts of E. H. Littooy, George F. Knowlton, Val E. Weyl, W. M. Tanner and David G. Hall,

BE IT RESOLVED that the Society express its gratitude for this favor to the Society and to the profession.

Resolution #9. WHEREAS the Hotel Utah, its employees, and the Chamber of Commerce have been most hospitable and helpful,

BE IT RESOLVED that the Executive Secretary express the Society's appreciation for their help and hospitality to the hotel management and to the Chamber of Commerce.

Resolution #10. WHEREAS the Honorable George D. Clyde, Governor of Utah, took time from his busy schedule to present an inspiring address of welcome to the Society, and the Mayor of Salt Lake City, Mr. A. F. Steward, welcomed us graciously at the banquet,

BE IT RESOLVED that the Executive Secretary express the Society's appreciation to the Governor and the Mayor for their courtesies.

Respectfully submitted,

CARROLL M. WILLIAMS
D. G. DENNING
DIAL F. MARTIN
H. BRUCE BOUDREAUX
HERBERT KNUTSON, *Chairman*

Chairman Knutson moved the adoption of these resolutions one by one as he read them. In each case there was a second from the floor and the resolution was unanimously adopted.

13. The President thanked Dr. Knutson and his Committee for a job well done. He called for additional new business. There being none, President Metcalf personally thanked all members of Society, and particularly the Executive Secretary, the Governing Board, the *Local Arrangements Committee*, the *Program Committee*, the *Publicity Committee* and the *Exhibits Committee*, for jobs well done. He especially thanked Parliamentarian Rogoff for his help during the business meeting. Then he asked Past-Presidents Herbert H. Ross and Roy E. Campbell to conduct President-Elect Paul W. Oman to platform.

14. Before taking over the meeting, Dr. Oman thanked President Metcalf personally for the privilege of serving his apprenticeship under him. He stated that he is deeply appreciative of the responsibility in accepting the office, would pledge untiring efforts and knew he would receive full cooperation. He thanked the assembly for the honor. He added before closing this meeting he would like to take cognizance of the next meeting in more detail, stating it is a joint meeting with the Entomological Society of Canada and the Entomological Society of Ontario to be held in Detroit in 1959. He then introduced the President of the Entomological Society of Canada, Dr. M. L. Prebble, and asked him to come forward and discuss the next meeting.

    Dr. M. L. Prebble addressed the group stating that little of the detail for the meeting can be given now. He said that in October he addended the meeting in Guelph, Ontario of the Entomological Society of Canada where there was wide attendance, and among those present were Secretary Nelson and Dr. Smith, 1959 Program Chairman. They expressed a sincere wish that meetings in Detroit be truly a joint meeting of the two entomological societies. He stated that the Canadian society was pleased to have this information submitted to them and pleased to accept the challenge of a joint meeting. He added that from contacts with the Entomological Society of America he anticipates little difficulty but much work. He stated that he attended last year's meeting at Memphis and was looking forward with great anticipation to a joint meeting.

    President Oman thanked Dr. Prebble.

15. President Oman then stated he had the further pleasant duty to perform and that was to ask Past Presidents C. E. Mickel and C. P. Clausen to escort President-Elect M. P. Jones to the platform.

16. President-Elect Jones expressed his appreciation for the confidence and honor bestowed upon him, stating he felt that any one of the other candidates would have made a much better president. He added that to help ease the consciences of those who had supported him he would like to make a few statements. He said he first attended a meeting in 1922 and since that time had attended 35 of the annual meetings—26 as a member and/or chairman of a committee, or officer of the Society. He said it had been his unusual privilege to have attended approximately one-half of the annual meetings of each of the five Branches. He thanked the group for the honor bestowed on him.

17. President Oman called for further business. There being none, the meeting adjourned at 4:30 P.M.

Respectfully submitted,
R. H. NELSON, *Executive Secretary*

ACTIONS OF THE 1959 GOVERNING BOARD

Initial Meeting, December 3, 1959

1. Representatives of the Entomological Society of Canada met with the Governing Board and formalized procedures for the 1959 joint meeting in Detroit. The Executive Secretary and the 1959 *Program Committee* Chairman had met with the Executive Board of the Canadian Society at their 1958 meeting in Guelph. Coordinating procedures discussed there were accepted by the Board. The principal coordinating will be carried out by *Program Committee* Chairman E. H. Smith and a Canadian counterpart to be appointed.

2. Rules for editorial procedures as drawn up by a Governing Board committee were adopted. The committee was composed of R. H. Nelson, F. W. Poos and E. G. Linsley, *Chairman*. (These rules are printed with the Reports of Editorial Boards elsewhere in this issue of the BULLETIN.)

3. The *Memorial Lecture Committee* is to be continued and a $100.00 honorarium for the person to be chosen to give the lecture was voted.

4. The 1959 Memorial Lecture will be in honor of C. V. Riley, while the 1960 Lecture will memorialize J. H. Comstock.

5. William M. Rogoff was reappointed as Parliamentarian.

6. President Oman appointed a committee to consider the matter of a permanent home for the Society. He named R. H. Nelson, Neeley Turner and Morris Rockstein.

Respectfully submitted,
R. H. NELSON, *Executive Secretary*

REPORT OF THE AUDITOR

November 10, 1958

Dr. R. L. Metcalf, *President*
Entomological Society of America
1530 P Street, N. W.
Washington, D. C.

Dear Dr. Metcalf:

In accordance with the recent request of Mr. R. H. Nelson, Executive Secretary of the Entomological Society of America, I have made an examination of the financial affairs of your Society for the year beginning November 1,

1957, and ending October 31, 1958. As a result of my examination, there are attached the following exhibits:

EXHIBIT "A" General Fund—Statement of Receipts and Disbursements for the year beginning November 1, 1957, and ending October 31, 1958.

EXHIBIT "B" Permanent Fund—Statement of Receipts and Disbursements for the year beginning November 1, 1957, and ending October 31, 1958.

EXHIBIT "C" Entoma—Statement of Receipts and Disbursements for the year beginning November 1, 1957, and ending October 31, 1958.

EXHIBIT "D" Thomas Say Foundation—Statement of Receipts and Disbursements for the year beginning November 1, 1957, and ending October 31, 1958.

Branch funds have not been accounted for in this report. There are at present five branches. Each branch has its own bank account, and has the authority to make expenditures for its activities and to receive registration fees for its meetings. These branches are not required to account to the Entomological Society of America for their receipts and expenditures.

In my opinion, subject to the above comments, the accompanying statements fairly reflect the recorded cash receipts and authorized disbursements made for the benefit of Entomological Society of America for the period beginning November 1, 1957, and ending October 31, 1958, on a basis consistent with that of previous periods.

Very truly yours,
JOHN A. HERL,
Certified Public Accountant

EXHIBIT "A"

ENTOMOLOGICAL SOCIETY OF AMERICA

GENERAL FUND

STATEMENT OF RECEIPTS AND DISBURSEMENTS

For the Year Ended October 31, 1958

BALANCE NOVEMBER 1, 1957		**$ 17,275.91**
RECEIPTS		
Membership Dues—Previous Years	$ 231.00	
1958	5,817.00	
Future Years	195.50	
Membership Journal Subscriptions—Previous Years	658.50	
1958	18,931.60	
Future Years	578.00	
Non-Member Journal Subscriptions—Previous Years	497.11	
1958	18,129.67	
Future Years	2,241.35	
Membership Annals Subscriptions—Previous Years	207.50	
1958	7,170.15	
Future Years	474.50	
Non-Member Annals Subscriptions—Previous Years	84.00	
1958	5,575.80	
Future Years	891.15	
Bulletin Sales—Member	9,281.28	
Non-Member	735.26	
Sales of Indices—Previous Years	887.10	
No. 15	460.11	
Sales of Annual Review	6,155.65	
Reprints—Journal	12,394.94	
Annals	3,504.06	
Advertising—Journal	3,211.24	
Annals	349.83	
Sales of Back Issues—Journal	2,096.68	
Annals	1,238.35	
Paid Papers—Journal	1,424.49	
Annals	539.93	
Sustaining Associates—1958	3,000.00	
Overpayments—Members	38.08	
Non-Members	31.98	
Addressograph Services	134.17	
Entoma	1,010.00	
Thomas Say Foundation	84.00	
Brochure No. 1	204.62	
Insect Facts	6.00	
Net Bank Fees on Exchange	6.52	
Meeting Income	4,157.77	
Dividends—Interstate Building and Loan Assn.	122.59	
Contributions	17.43	
Sale of Chair	2.00	
Printing	20.40	
History of Entomology of World War II	112.00	
Reimbursed Travel Expense	77.16	
Returned Checks Made Good	70.90	
Payroll Taxes Withheld	4,857.82	
TOTAL RECEIPTS		**$117,915.19**
TOTAL CASH TO BE ACCOUNTED FOR		**$135,191.10**

DISBURSEMENTS		
Journal—Printing and Mailing	$25,323.08	
Engraving	1,406.69	
Reprints	4,254.43	
Annals—Printing and Mailing	17,666.15	
Engraving	1,244.44	
Reprints	1,679.36	
Costs—Back Issues—Journal	639.58	
Annals	323.34	
Annual Review	7,404.31	
Refunds—Membership Dues	32.00	
Subscriptions	151.75	
Bulletin Expense	7,971.83	
Miscellaneous Printing Expense	2,279.60	
Payroll Taxes—Employee's Portion	4,857.82	
Employer's Portion	519.49	
Salaries and Wages	28,810.54	
Telephone and Telegraph	178.56	
Postage Expense	2,241.73	
Office Supplies	2,585.38	
Office Furniture and Fixtures	1,998.91	
Transfer of Funds—Entoma	11.00	
Thomas Say Foundation	84.00	
Travel Expense	2,723.21	
Auditing Expense	300.00	
Meeting Expense	1,624.91	
Returned Checks	80.90	
Index Expense	195.98	
Zoological Society of London	100.00	
Refund of Overpayments	36.08	
Retirement Annuity—Executive Secretary	500.00	
Insurance	129.05	
Contributions	10.00	
Legal Services	150.00	
Miscellaneous Expense	9.91	
TOTAL DISBURSEMENTS		**$117,524.03**
BALANCE OCTOBER 31, 1958		**$ 17,667.07**
ABOVE BALANCE ACCOUNTED FOR AS FOLLOWS:		
Cash in National Bank of Washington	$13,031.85	
Petty Cash	12.63	
Cash in Interstate Building and Loan Assn.	4,622.59	
TOTAL		**$ 17,667.07**

NOTE: The comments form an integral part of this statement.

EXHIBIT "B"

ENTOMOLOGICAL SOCIETY OF AMERICA

PERMANENT FUND

STATEMENT OF RECEIPTS AND DISBURSEMENTS

For the Year Ended October 31, 1958

BALANCE NOVEMBER 1, 1957		**$ 30,049.73**
RECEIPTS		
Interest on Series G, U. S. Treasury Bonds	$ 62.50	
Interest on Province of Ontario Bonds	103.66	
Interest on Savings Account—Perpetual Building Assn.	255.87	
First Federal Savings and Loan Assn.	316.98	
District Building and Loan Assn.	172.41	
Increment in Redemption Value of Series F, U. S. Treasury Bonds	169.00	
TOTAL RECEIPTS		1,080.42
BALANCE OCTOBER 31, 1958		**$ 31,130.15**

ABOVE BALANCE ACCOUNTED FOR AS FOLLOWS:

Face Value	Securities	Book Value	
$2,000.00	Province of Ontario, 5% Debenture Bonds of 1959—Cost	2,000.00	
6,500.00	U. S. Treasury Bonds—Series F	5,850.00	
$8,500.00			$ 7,850.00
CASH			
	First Federal Savings and Loan Association	$ 8,034.39	
	District Building and Loan Association	7,734.91	
	Perpetual Building Association	7,510.85	
	TOTAL CASH		23,280.15
	TOTAL SECURITIES AND CASH		$ 31,130.15

NOTE: The comments form an integral part of this statement.

EXHIBIT "C"

ENTOMOLOGICAL SOCIETY OF AMERICA

ENTOMA

STATEMENT OF RECEIPTS AND DISBURSEMENTS

For the Year Ended October 31, 1958

EDITION 12

BALANCE NOVEMBER 1, 1957		$ 99.57
RECEIPTS		
Book Sales	$ 4,337.16	
Advertising and Listings	4,617.49	
TOTAL RECEIPTS		$ 8,954.65
TOTAL TO BE ACCOUNTED FOR		$ 9,054.22
DISBURSEMENTS		
Auditing Service	$ 10.00	
Stationery and Office Supplies	68.35	
Postage and Mailing Expense	568.43	
Promotional Supplies (Announcements)	50.00	
Telephone and Telegraph	8.18	
Banking Service	22.20	
Editorial and Secretarial Work	2,241.30	
Printing	4,395.05	
Honoraria to Authors	127.00	
Refunds—Overpayments	68.65	
Returned Checks	4.00	
TOTAL DISBURSEMENTS		$ 7,563.16
Transfer of Funds to Entomological Society of America		1,000.00
Bank Balance, October 31, 1958		491.06
TOTAL ACCOUNTED FOR		$ 9,054.22

NOTE: The comments form an integral part of this statement.

The above statement was prepared from information furnished without independent verification by me because of geographical distribution of original records. Therefore, no opinion can be expressed either as to its accuracy or to the consistency with which generally accepted accounting principles were applied.

EXHIBIT "D"

ENTOMOLOGICAL SOCIETY OF AMERICA

THOMAS SAY FOUNDATION

STATEMENT OF RECEIPTS AND DISBURSEMENTS

For the Year Ended October 31, 1958

BALANCE NOVEMBER 1, 1957		$ 3,164.77
RECEIPTS		
Interest on Savings Account	$ 116.20	
Sale of Books	505.68	
TOTAL RECEIPTS		$ 621.88
TOTAL TO BE ACCOUNTED FOR		3,786.65
DISBURSEMENTS		
Binding Volume No. 1	$ 199.58	
Refund on Purchase of Thomas Say Foundation Publications	15.07	
TOTAL DISBURSEMENTS		$ 214.65
BALANCE OCTOBER 31, 1958		$ 3,572.00
ABOVE BALANCE ACCOUNTED FOR AS FOLLOWS:		
Savings Account—Guardian Federal Savings and Loan Association		$ 3,572.00

NOTE: The comments form an integral part of this statement.

ENTOMOLOGICAL SOCIETIES OF CANADA, 1959

Presidents (first) **and Secretaries** (second)

Entomological Society of Canada
DR. M. L. PREBBLE, Forest Biology Division, Ottawa
MR. L. I. REED, Plant Protection Division, Ottawa

Acadian Entomological Society
MR. C. J. S. FOX, Science Service Laboratory, Kentville, N. S.
MR. N. A. PATTERSON, Science Service Laboratory, Kentville, N. S.

Entomological Society of Quebec
DR. F. O. MORRISON, Macdonald College
MR. P. MORISSET, Quebec, Department of Agriculture, Quebec

Entomological Society of Ontario
PROF. A. G. MCNALLY, Ontario Agricultural College, Guelph
PROF. W. C. ALLAN, Ontario Agricultural College, Guelph

Entomological Society of Manitoba
MR. P. H. WESTDAL, Entomology Section, Canada Dept. of Agriculture Research Lab., Winnipeg
MR. W. G. H. IVES, Forest Biology Laboratory, Winnipeg

Entomological Society of Saskatchewan
DR. H. MCDONALD, Entomology Section, Canada Dept. of Agriculture Research Lab., Saskatoon
MR. C. H. CRAIG, Entomology Section, Canada Dept. of Agriculture Research Lab., Saskatoon

Entomological Society of Alberta
MR. C. E. BROWN, Forest Biology Laboratory, Calgary
MR. R. W. STARK, Forest Biology Laboratory, Calgary

Entomological Society of British Columbia
DR. D. A. ROSS, Forest Biology Laboratory, Vernon
MR. L. C. CURTIS, Entomology Laboratory, Kamloops

INTERNATIONAL SYMPOSIUM ANNOUNCEMENT

The International Symposium concerning the problems of ontogenetic development of insects with special attention paid to the method of experimental work is herewith announced.

On the occasion of the Second Czechoslovak Entomological Conference, arranged under the auspices of the Biological Section of the Czechoslovak Academy of Science and in collaboration with other institutions, an International Symposium concerning the problems of ontogenetic development of insects with special attention paid to the method of experimental work will be held in Prague in the first half of September 1959.

All applications for attendance and for lectures send to the Secretariat of the Symposium, which will likewise supply all required informations.

Address: Entomological Laboratory,
Czechoslovak Academy of Science
7 Viničná
Prague 2, Czechoslovakia

Invitations with preliminary program will be sent in the first quarter of 1959.

Secretariat of the Symposium

REPORTS OF STANDING COMMITTEES FOR 1958

REPORT OF THE PROGRAM COMMITTEE

The printed program of the 1958 Annual Meeting of the Entomological Society of America will serve as the chief report for this committee. The program at Salt Lake City, December 1–4, included 236 submitted papers, 10 invitational presentations, and 62 presentations in 11 symposiums. In addition, there were special features such as movies, special interest group meetings, exhibits, etc. This program featured the first presentations of the Society's Memorial Lecture and Insect Photo Salon.

The participation in the 1958 program was approximately 20% greater than that in 1957, which in turn was equally greater than in 1956. This year's program was scheduled for 3½ days as compared to 4 days in 1957. The reduction in length of program was accomplished by decreasing the time spent in general sessions and by increasing the length of many of the individual section sessions, and by having more concurrent sessions on the last morning of the meeting. By restricting abstracts to 50 words and by combining the detailed program and abstracts, the printed program was reduced from 88 pages in 1957 to 32 pages in 1958.

The increase in participation and the resulting crowding of the 1958 program strongly emphasizes the importance of timing of all presentations and rigid adherence to the schedule.

In view of the rapid increase in the volume of the program during recent years, this committee urges the President, Governing Board and the Executive Secretary to review the recent program questionnaire and establish as soon as possible program policies that will help this committee keep the program attractive, well-balanced and of a practical size.

Respectfully submitted,
EDWARD H. SMITH
E. N. WOODBURY
LAUREN D. ANDERSON, *Chairman*

Governing Board Action

Report accepted by the Board. The following statement on program policies was recommended to the Governing Board by the *Program Committee*. It was regularly moved, seconded and carried that these policies be adopted for the Society.

Entomological Society of America
Program Policies

1. The deadline for receipt of titles and abstracts by the *Chairman* of the *Program Committee* will continue to be September 1.
2. The *Program Committee* will not be obligated to include in the program titles received after the deadline date.
3. The deadline applies to programs planned by section officers (symposiums, invitational papers, etc.) as well as to submitted papers.
4. The *Program Committee* will, if convenient, include in the program or program supplement titles received after the deadline date.
5. The *Program Committee* shall publish in the BULLETIN a statement on policies and rules for the following annual meeting.
6. Papers not conforming to requirements as regards abstracts, etc., will not be considered as meeting the requirements of receipt for program purposes. If time permits the applicant will be notified of rejection of his paper so that it may be corrected and re-submitted.
7. Presentation aids will be limited to the following, except by special arrangement:
   2 x 2 and 3¼ x 4¼ slide projectors
   16 mm movie projectors
   Blackboards
   Duplicated material for distribution
8. Section officers shall plan section and subsection features such as invitational papers, symposia, etc., subject to approval of the *Program Committee*.
9. The *Program Committee* may at its discretion limit the number of papers to one senior authorship per person.

REPORT OF THE MEMBERSHIP COMMITTEE

The *Membership Committee* which is reporting herewith follows after three committees which carried out very specific recruiting programs.

These committees, respectively, in 1955, made a vigorous campaign to gather in the "missing entomologists," i.e., established entomologists who were not E.S.A. members; in 1956, emphasized personal contact with prospective members, through active members in the respective areas; and in 1957 made a special effort to work through the several Branches, and institutions where entomology was taught or where entomologists were employed.

Having reviewed these efforts of the recent past, the present *Membership Committee* felt that the most fruitful activity this year might be a personal letter to the 1958 graduates and also to the 1957 graduates in entomology, (1) to remind those who had been student members of the necessity for transferring their student membership to full membership, and (2) to see to it that all recent graduates were fully acquainted with the advantages of membership in the E.S.A.

Each member of the committee, therefore, assumed for a specific geographical area, the responsibility for obtaining from each school, college and university in his area the names and addresses of this year's graduates in entomology and of last year's graduates. These names were assembled and checked against the membership list in the office of the Executive Secretary.

Then a membership form and a letter which mentioned the advantages of membership and contained an invitation to join the society, were sent to each person who was not a member.

As of October first, 1958, of 246 student names obtained and checked in this way, 139 were found to be already student members. The remaining 107 were considered to be prospective members and were circularized as described.

In addition, the membership lists of such related societies as the American Mosquito Control Association were compared with the E.S.A. membership list and appropriate letters and application forms were sent members who were not members of E.S.A., but whose profession or position indicated a probable interest in entomology. Approximately eighty letters of invitation were sent out to persons in this category.

During 1958, 221 new members joined the Society as active members, and 113 as student members. (Figures compiled as of December 1, 1958).

The Committee extends its sincerest thanks to the Executive Secretary and his staff, to the officials of schools and colleges who compiled and supplied lists of names, and to all other members and non-members alike who assisted in its activities.

Respectfully submitted,
H. O. LUND
ROY W. RINGS
L. A. CARRUTH
W. G. EDEN
P. A. GLICK
D. L. COLLINS, *Chairman*

Governing Board Action

The Report was accepted by the Board. The Board also unanimously confirmed the election of the new members.

REPORT OF THE COMMITTEE ON ENTOMOLOGICAL NOMENCLATURE

At the start of the year 1958 the *Committee on Entomological Nomenclature* had two main projects. One was the proposed work on family names of insects which the former chairman, John Medler, had proposed. The second was the job of preparing for the Colloquium and Commission meetings on Zoological Nomenclature to be held in London in July. Since the latter subject was clearly the most urgent, our committee devoted its full attention to reviewing the draft of the new code and to questions on nomenclature that were proposed for discussion in London.

The Entomological Society of America was represented in London by several members and the Nomenclature Committee itself was represented by the following: R. L. Usinger, C. W. Sabrosky and J. L. Gressitt.

It is scarcely possible in a brief report to detail the long and complicated matters that were discussed during the Nomenclature sessions in London. Suffice it to say that the following major decisions were taken:

1. All provisions for naming groups higher than the family group (orders, classes, etc) were removed.
2. The provisions for naming hybrids were deleted.
3. Details were given for methods of changing family names when the type genus is a synonym or homonym.
4. The provision for collective groups without type species was maintained and the proposal for "parataxa" was defeated.
5. A statute of limitations was adopted which provides that no name is to be changed if it has been used consistently for more than 50 years.
6. The rules adopted at Paris for recognition of infra subspecific names were repealed.
7. It was agreed that the English and French versions of the new code would both be authoritative and the Commission would decide questions that might arise from different interpretations of the two codes.
8. The rule adopted at Paris for the permanent suppression of secondary homonyms was reversed.

It can be seen from the above points that several cases of reversal were adopted. Some of us felt that this was a mistake and that no stability can be achieved if each Congress sets out to undo what the previous Congress accomplished. This leads to a general commentary on the London meetings. There is no doubt that much was accomplished and that a revised code is now a definite possibility. In fact, a Review Committee is now at work on the final draft and we are led to believe that an up-to-date code will be published and available at a low price some time within the next three or four months. If this really happens it will perhaps justify all the time and effort because we have had no working code at all for 10 years and the last version that was at all current was published many years before this.

This report would not be complete without some remarks on the general feelings expressed by entomologists during and after the sessions at London. The problems of entomological nomenclature are different from those of many other disciplines within Zoology, not in kind but in number. We have so many more names to deal with in insects that problems dealt with more or less in the abstract by some taxonomists become urgent and overwhelming as applied to insects. The most serious aspect of the Hemming regime was the tendency to centralize and personalize nomenclatural procedures. The result of the past 15 years has been the centralization of handling of everything in the hands of a paid secretariat. Automatic nomenclature has disappeared and one now finds it necessary to refer many questions to the Commission during the course of almost every monographic work. Entomologists as a group and as individuals appear to be overwhelmingly, if not unanimously, opposed to this trend and there are significant groups in other disciplines with the same feeling. However, we were outvoted on any question that involved simplification of procedures or reduction in the load of work to be referred to the Commission. Just what this means for the future is difficult to say but there are persons in our Society who have expressed themselves as unwilling to follow the cumbersome procedures required that involve submission of many proposals to the overworked Commission.

Finally, I feel that some mention should be made of the fate of the Interim Committee that was appointed at Copenhagen to carry out a plan for the establishment of a new Secretariat and a complete revision of the publication program of the International Trust. The object was to get rid of the high costs of a paid Secretariat and spread the cost of publications by reducing the price and establishing an International Association with membership dues so low that thousands, rather than dozens, of persons could participate in this important activity. The Entomological Society of America supported the work of the Interim Committee with a grant of $50. I am pleased to be able to report that the Interim Committee met in Leiden early in July and prepared a formal report which was submitted to the Section on Nomenclature of the International Congress in London. I am sorry to say that the plan was not adopted for reasons that are too involved and obscure to be analyzed or reported at this time. On the optimistic side I may say that there is some evidence that the force of arguments penetrated sufficiently so that we may see some results in terms of decreased costs. At least Dr. Melville, the successor to Mr. Hemming, has given assurance that this will be so.

Respectfully submitted,
D. E. HARDY
R. M. BOHART
C. B. PHILIP
J. L. LAFFOON
H. K. TOWNES
J. A. SLATER
C. W. SABROSKY
G. S. WALLEY
R. L. USINGER, *Chairman*

Governing Board Action

The Report was accepted by the Board.

REPORT OF COMMITTEE ON COMMON NAMES OF INSECTS

During 1958 sixteen proposals for new common names, changes in existing common names, or changes in scientific names of common named insects have been received by the Committee.

Although no ballots have been sent to the committee members during the current year, it is expected that one will be mailed before January 1, covering the above proposals.

In view of the large numbers of additional common names now approved, and the considerable number of changes in scientific names, it is hoped that a new edition of the entire list can be prepared and published before January 1, 1960.

Respectfully submitted,
L. C. KUITERT
J. L. LAFFOON
L. O. WARREN
F. P. KEEN
A. V. MITCHENER
R. I. SAILER
R. H. PAINTER
R. F. SMITH
H. H. SCHWARDT, *Chairman*

Governing Board Action

The Report was accepted by the Board.

REPORT OF THE COMMITTEE ON INSECTICIDE TERMINOLOGY

A majority and a minority report were presented to the Governing Board. These were accepted without approval and with a Board recommendation that the 1959 committee attempt to resolve the matter.

At a subsequent meeting of the Governing Board a motion was made, seconded and passed as follows; Until common names of chemical compounds are available to the Editors of Society publications, they shall use their well known editorial prerogatives as to designations employed in Society publications, provided compounds are identified by proper chemical names and the general courtesies of trade marked designations are exercised.

A list of common names of insecticides agreed upon by the 1959 committee will be published in the April 1959 JOURNAL OF ECONOMIC ENTOMOLOGY. The names will be used in all Society publications. Other material from the committee will be printed in the BULLETIN.

REPORT OF THE COMMITTEE ON INSECTICIDE REFERENCE STANDARDS

To increase the reliability of toxicity data by providing reference standard insecticides, the Entomological Society of America in 1951 set up the *Insecticide Reference Standards Committee*. This committee selected the insecticides to be included, arranged for their procurement from basic manufacturers, and has sponsored their distribution through the Nutritional Biochemicals Corporation, Cleveland, Ohio. Reference standard insecticides or miticides have been selected on the basis of the following qualifications:

1. Standards should be in large scale production and uniform in quality.
2. Physical and chemical specifications, especially the percentage of active ingredients, should be available.
3. Standards meeting the specifications should be reproducible by the manufacturers.
4. Standards should be stable compounds with reasonably long shelf-lives.

As a result of several years of effort we are able to report that, beginning in 1958, eighteen Reference Standard Insecticides are being distributed by Nutritional Biochemicals Corporation. In addition, a Specification List prepared by the committee giving the purity and contents, physical properties, and storage and shipping precautions for each standard is supplied with every shipment, as well as being available from the secretary of the E.S.A. and members of the committee.

The E.S.A. Insecticide Reference Standards available are:

aldrin, technical
allethrin, technical
Aramite, technical
chlordane, reference grade
DDT, technical
*p,p'*DDT
dieldrin, technical
endrin, technical
heptachlor, technical
lindane
methoxychlor, technical
methyl parathion, 80% technical
ovex, technical
parathion, technical
Perthane, technical
Phosdrin, technical
Strobane, technical
toxaphene, technical

The committee wishes to publicly thank the manufacturers who furnished materials and specifications, in most cases gratis. Distribution of the standards is moving along smoothly and their sales are increasing. It is hoped that through increased use, an even greater demand will be stimulated. This will reflect favorably upon the basic ideas that your committee attempts to promote.

Respectfully submitted,
GEORGE F. LUDVIK
JOHN E. CASIDA
LYNN H. DAWSEY
FRANK W. FISK, *Chairman*

Governing Board Action

Report was accepted by the Board.

REPORT OF THE COMMITTEE ON INSECT SURVEYS

The Committee met in the Cosmopolitan Hotel, Denver, Colorado, April 22–24, 1958. The Committee covered an agenda of 13 topics which had been prepared previously by Committee members and several additional topics which came up during the discussions. The following recommendations were agreed upon by vote of those present, and with slight revisions resulting from subsequent correspondence between the Chairman and Committee members are submitted to the Society for approval:

1. *Whereas* the Committee noted the progress that has been made during the past two years by several states in collecting and reporting estimates of losses attributable to insects, costs of controlling insects on certain crops and in some cases estimated savings resulting from chemical control activities, and whereas it was further observed that there has been a lack of uniformity in the form in which such reports have been prepared thus making the collation and consolidation of the information difficult, if not impossible. The Committee, therefore, suggests that the Society recommend that: (1) all workers preparing estimates of losses attributable to insects use a form which has been prepared and distributed by the Plant Pest Survey Section, improvement, adaptability and extension of this form to be worked out with and by the Plant Pest Survey Section; (2) all workers who prepare such reports should forward a copy through normal channels, each state clearing house should consolidate reports covering losses within its boundaries and forward such reports to the Plant Pest Survey Section for further consolidation and publication in the Cooperative Economic Insect Report; (3) the Plant Pest Survey Section should assume the responsibility for distributing proposed reporting forms to interested workers, and (4) the Plant Pest Survey Section should publish an annual consolidation and compilation of all reports specifically relating to losses attributable to insects including costs of chemically controlling insects on crops, in buildings, in storage, on livestock, and other costs as they become available.

It is recognized by the Committee that such an annual compilation may be delayed because of interdependence of the preparation of loss estimates on the publication of Agricultural Marketing Service Reports of acreage and yields. Such delay should not discourage nor deter the preparation of an "annual" devoted to consolidated information relating to losses attributable to insects and closely related arthropod although publication date may necessarily occur 1 to 2 years late.

The Committee suggests that the Society forward copies of this recommendation to the Director, Plant Pest Control Division, to the Chairman of the Committee on Agricultural Pests, Agricultural Board NAS-NRC, to the Chairman of the Subcommittee on Insects, Subcommittee on Agricultural Pests, Agricultural Board NAS-NRC and to the Director of each Agricultural Experiment Station where entomological research and insect control is carried out; to the Director, Agricultural Research Service, U. S. Department of Agriculture; to the Secretary, National Agricultural Chemicals Association, and to the Secretary, National Pest Control Association.

2. *Whereas* the entomological activities and problems of the Armed Forces are extensive and diverse, the extent of international movement of equipment and materials offers opportunities for the introduction of exotic insect pests and vectors into this country, and valuable contributions may be made to the cooperative Insect Survey by entomologists of the Armed Forces, especially in the detection of newly introduced pests, the Committee recommends that the Society increase the membership of the Committee on Insect Surveys to include a representative of the U. S. Department of Defense. In the opinion of the Committee the individual occupying the position of Secretary of the Armed Forces Pest Control Board could serve most effectively in this capacity.

3. *Whereas* it is the consensus of the Committee that a lack of information concerning the factors responsible for fluctuations in insect populations makes it impossible to forecast adequately populations of many species, and whereas, such forecasts would increase the efficiency of insect control procedures generally, and whereas, this type of information is vital to insect control activities both public and private, the Committee recommends that the Society call the need of basic research on insect population dynamics to the attention of the Administrator, Agricultural Research Service and to each Director of the State Agricultural Experiment Stations.

4. *Whereas* the series on insects not known to occur in the United States, being published by the Plant Pest Survey Section, is fulfilling an often-expressed need for information on foreign pests likely to be introduced into the United States and serves as an aid to early detection of incipient infestations through description of the pest and typical damage as well as the record of known hosts, the Committee recommends that the Society urge the Section to develop a list of dangerous foreign insects and to expand and accelerate the publication of the information so gained, and that the Society request the cooperation, with the Section, of State and private agencies as well as an expansion of the existing cooperation between those in the Federal Government such as the Plant Quarantine Division and the Entomology Research Division of the Department of Agriculture in making available such records on foreign pests as they may have, and the National Museum of the Smithsonian Institution in making available such pertinent information as may be obtained from the National Collection of insects.

5. *Whereas* much progres has been made in insect survey and detection work under the leadership of the Plant Pest Control Division, and in the opinion of the Committee the series being published in the Cooperative Economic Insect Reports, particularly Volume 7, on insects not known to occur in the United States are especially valuable contributions, the Committee suggests that the Society commend the Plant Pest Survey Section for this important work.

ATTENDANCE AT DENVER, COLORADO

Members	Guests
W. E. McCauley, Chairman	H. E. Yost
N. O. Barry	J. I. Cowger
K. D. Quarterman	R. B. Thrailkill
D. W. Hamilton	T. D. Persons
J. N. Roney	W. Shockley
L. D. Newsom	H. A. Hauke
N. D. Wygant (for R. L. Furniss)	H. E. Gates
K. Dorward (Ex Officio)	E. D. Burgess
W. H. Anderson (for P. W. Oman, Ex Officio)	L. Jenkins
C. A. Bower (Absent)	

6. *Whereas* there is a need for more active participation in insect survey and detection work by entomologists generally, the Committee suggests that the Society urge the Plant Pest Survey Section to increase distribution of the Cooperative Economic Insect Report to all agencies directly or indirectly concerned with insect problems in an effort to get additional cooperation in reporting.

7. The Committee unanimously agreed that the Committee on Insect Surveys be continued.

8. The Committee submitted a list of names for consideration in replacing members whose terms would expire at the end of the 1958 meeting.

The Committee moved the adoption and proper channeling of these recommendations through the office of the Executive Secretary, Entomological Society of America.

Respectfully submitted,

N. O. Berry
K. D. Quarterman
D. W. Hamilton
J. N. Roney
L. D. Newsom
R. L. Furniss
C. A. Bower
W. E. McCauley, *Chairman*

Governing Board Action

The Report was accepted by the Board.

REPORT OF THE COMMITTEE ON FINANCE

Recommendations:

1. It is proposed that the Society establish an Endowment Fund to attract grants of money to better the Society and the profession.
2. The Society should institute a Scholarship Fund to provide worthwhile awards to outstanding students.

Endowment Fund

It is proposed that an Endowment Fund be started with the $4,622.59 of gift money and General Fund interest income now held by the Society as part of the General Fund in a Building and Loan savings account. Additions to the proposed Endowment Fund might accrue from two sources. Interest from the General Fund could be transferred to the Endowment Fund at the end of each fiscal year to provide approximately $600 per annum. The second source of income would consist of gifts (cash, property, stocks, or bonds) from members or persons interested in promoting entomology or the Society itself. Such gifts to non-profit incorporated scientific organizations like the E.S.A. are deductible for tax purposes. Our present constitution provides for donations to be added to the Permanent Fund so a donor would have to select the fund to receive his gift.

Investment of the Endowment money in bonds and Savings and Loan Associations would return 3.5 per cent if continued under the same program used for the General Fund. As an alternative, society member, Everett Oertel of Baton Rouge, has suggested placing fifty to sixty per cent of permanently invested money in sound, growing common stocks. It is the opinion of the Finance Committee that this procedure would net the greatest return. Some may feel that such a disposition of funds is not in keeping with a scientific society, but it might be mentioned that on July 1, 1958, staff members at the University of Wisconsin had the opportunity to assign one-half of their retirement money for investment in common stocks. The University of Wisconsin was no doubt motivated by the experience of the Wisconsin Alumni Research Foundation, which increased a $12,000,000 income during a 32-year period to an accumulated worth of $58,000,000 mostly by an aggressive investment policy in selected common stocks.

The long range purpose of the Endowment Fund should be an investment to support a scholarship program. Therefore, it is proposed that earnings from the Endowment Fund be placed in a Scholarship Fund as described in the following section.

Scholarship Fund

As the official organization of professional entomologists in the United States, the Society should do all in its power to encourage the study of entomology and attract students to the profession. A start was made in this direction when a brochure was prepared covering the opportunities in professional entomology. However, in the very competitive race for good students we cannot rely on this medium entirely but in addition, we should be in a position to offer one or more annual scholarships in entomology. The people in education and industry have turned more and more to scholarships in an attempt to get able students into the learned professions. Entomology must be a part of this reemphasis on education and our Society is the logical agency to perform this function on a national basis.

University scholarships vary from single payments around 100 dollars to four year grants covering all expenses at the most costly institutions (see attached). Small scholarships might be offered to a number of potential entomology students each year, but such a practice would not attract outstanding students. It would be more desirable to offer one or two annual scholarships in the $1,200–1,500 range.

An annual Scholarship Fund of $3,000 could be established by the following procedure:

A. Investment earnings from the Endowment Fund $4,600 at 3.5%	$ 161
B. Annual payments by Sustaining Associates 30 at $100 each	3,000
	$3,161

At the present time, contributions from Sustaining Associates are placed in the General Fund to be used for the Society as a whole. This money was sorely needed during the first few years after amalgamation and the Society is most appreciative of this assistance. Our members recently voted a dues increase to become effective in 1959 and with this added income it will be increasingly difficult to solicit money for the Sustaining Associate program as it is now constituted. It is the opinion of the Finance Committee, that these contributors would rather provide a grant to a Scholarship Fund than give philanthropic support to a 4600 member professional society. In the proposed scheme, the Associates and the Society would be contributing to the future of Entomology.

Membership Card:

During the 1957 meeting of the Governing Board, the Committee on Society Membership Insignia proposed a membership card which would serve to identify members of the Society and to be a receipt from the Society office following payment of dues. The 1957 Board deferred action on this matter, until the Finance Committee had an opportunity to make a cost study.

Secretary Nelson has suggested the use of a $3\frac{5}{8}''$ x $8\frac{5}{8}''$ combination card (to fit a number 9 window envelope) from which the membership card ($2\frac{1}{4}''$ x $3\frac{3}{4}''$) can be punched. The card would carry the year, the name and insignia of the Society, and be imprinted with the name and address of the member with the address plate now used for mailings. The following cost estimates have been obtained for the preparation of 5000 combination cards:

Washington, D. C.	$100.00
Madison, Wisconsin	105.00
Chicago, Illinois	110.00

The adoption of a membership card would involve the use of special envelopes and a separate mailing. Thus, for our 4600 members, $46.00 would be required for envelopes and $92.00 for 3rd class mailing with additional postage outside the U.S.A. Additional printing on the combination card might amount to another $50.00. This venture could be expected to cost the Society a minimum of $300.00 a year.

Respectfully submitted,
S. E. Jones
J. E. Bussart
J. W. Apple, *Chairman*

Governing Board Action

On recommendation 1. The Board action on this recommendation was as follows: It was moved, seconded and passed that the Governing Board establish a Building Fund to receive funds currently available and to become available through contributions from any and all sources. Monies in this Building Fund may be expended for a Society headquarters upon approval of the Governing Board.

On recommendation 2. The Board action on this recommendation was as follows: It was moved, seconded, and passed that the consideration of a Scholarship Fund as a possible objective of a special fund be deferred in view of more urgent projects and the lack of an acceptable proposal for its administration.

In the matter of a membership card the Board directed the Executive Secretary to furnish membership cards once to each member.

REPORT OF THE COMMITTEE ON PROFESSIONAL TRAINING, STANDARDS, AND STATUS

Introduction

For fullest understanding, and in the interest of conciseness, this report should be read against a background knowledge of the 1957 report of this Committee (published in condensed form in the Bul. Ent. Soc. Amer. 4(2). 1958). As pointed out there, professionalism has a variety of meanings, a variety which is apparently limited only by the number of entomologists consulted. Because of this, the 1957 activities of this Committee were largely concerned with preparing an overall review of as much of the entire subject as could be developed from the beliefs and experiences of the Committee members. The report was terminated with four recommendations for future action, of which the Governing Board approved the following three:

(a) The Committee be authorized to embark upon a study of entomological training.

(b) The Committee be authorized to conduct a study of present Federal Civil Service standards for the employment of entomologists.

(c) That the report be published in its entirety in the Bulletin of the Entomological Society of America (the Board modified this by directing that a condensed version of the report be published, an action which has already been accomplished).

Actions taken on recommendations (a) and (b) are briefly reported here.

Entomological Training

The recommendation that a study be made of entomological training was advocated in the belief that training is basic to the attainment of professional status. The immediate goal of this study was visualized to be the determination, through the circularization of appropriate institutions of higher learning, of the training required for graduation as an entomology major. Other goals will be established subsequent to the detailed study and analysis of the data resulting from this first study. Dr. S. B. Freeborn consented to serve as the chairman of a Subcommittee on Entomological Training. Serving with him on this subcommittee are Doctors J. T. Creighton, E. J. Gerberg, G. G. Gyrisco, and H. I. Scudder. An appropriate questionnaire has been prepared and is being circulated by this Subcommittee to all institutions engaged in training ento-

mologists. It is planned that this Subcommittee will incorporate the data so obtained into a comprehensive initial study of entomological training which they will publish in such manner as is subsequently authorized or directed by the Governing Board. Dr. Freeborn and his group are to be highly commended for the progressive way in which they have initiated and are carrying out this very important study.

Civil Service Standards for Entomologists

It was pointed out in the 1957 Report that entomology is inadequately classified by the U. S. Civil Service Commission, i.e., that the "Entomology Series" is limited to research, and with only four major specializations being recognized thereunder. This is in marked contrast to such series as that for Agronomy where, in addition to research, positions are provided in management and operational agronomy and eleven major sub-specializations are recognized. Because of this situation, the Committee requested authorization to approach the U. S. Civil Service Commission to determine what could be done to improve the status of entomologists. This authorization was granted.

As a first step, Mr. W. Doyle Reed and Dr. A. W. Lindquist consented to initiate the study. Based upon this consideration, it was concluded that the Entomology Series of the Civil Service Class Specifications is indeed badly in need of a rewrite if it is to be up to date with the present comprehensive use made of entomologists in federal service, and if entomologists employed under Civil Service are to have fullest professional recognition.

Accordingly, a letter was prepared to Mr. Harris Ellsworth, Chairman, U. S. Civil Service Commission, pointing out the inadequacy of the present Entomology Series and stating that the Entomological Society of America is desirous of being permitted to cooperate with the Commission in revising this Series. President Metcalf signed this letter. Subsequently, an answer was received from C. Mansel Keene, Chief of the Standards Division, in which he stated that it did not appear practical to schedule the Entomology Series for revision during the present fiscal year (through June 30, 1959). The reasons given for this situation are quoted verbatim from his letter, as follows: "We are making great strides in bringing our classification standards up to date, but we still have a considerable backlog of work before us. Consequently, we find it necessary to schedule our immediate efforts in those areas of greatest need, as expressed by using agencies, and, to some extent, in terms of occupational population. When we received your letter, we were awaiting listings from Federal agencies as to classification standards for which they felt the most urgent need. As it turned out, the Entomology Series was not among those listed. Neither is it a particularly heavily populated occupation, although there are enough positions in the series to warrant preparation of a standard as priorities permit. However, we do not feel, under the circumstances, that we can give it a top priority. At the same time, we are working on a special project which we hope will result in generalized classification guides for research positions which will be applicable across occupational lines. Since many entomological jobs are of a research nature, such a guide would have considerable applicability to the series. If the generalized approach is successful, it may not be necessary to write complete classification standards for each research occupation. . . . We do recognize, however, that there is a need for review, and, very likely, for revision, of the present standards for the Entomology Series. While we cannot give it our immediate attention, it will come up for attention in the not far distant future, at which time we should very much appreciate the advice of your Society, and your comments on standards drafts."

From this answer, two things are immediately apparent. First, no one currently employing Federal Civil Service entomologists thought the situation serious enough to request that the Entomology Series be reworked. Secondly, our problem has been, in part at least, misunderstood. Whereas, Mr. Keene spoke of plans for a new system of classification guides for research positions, the most pressing immediate problem is that in order for a position to be labelled as entomological it must be in the research area. No classification exists for entomologically labelled positions in either management or operations. When entomologists are employed in these areas they must be labelled "General" or some other non-meaningful term. This situation not only makes it difficult to write up new job positions for entomologists to be employed in areas other than research, but results in a loss of prestige for entomology in general.

At this point, it became obvious that the assistance of the Department of Agriculture must be obtained if any progress was to be made with this problem, since they are far and away the single largest employer of Civil Service entomologists. Accordingly, a meeting was arranged with Dr. E. F. Knipling, Director of the Entomological Research Division, Agricultural Research Service, during which he was acquainted with this problem. He has assured the Committee of his fullest support and is currently having the problem, insofar as it affects the Entomological Research Division, investigated. When such progress is made as will cause the Civil Service Commission to take up consideration of the Entomology Series, it is proposed that a subcommittee be established from Washington area entomologists in federal employment to work with the Commission.

Miscellaneous

Interest in professional matters by entomologists continues to grow, as is evidenced by the interest expressed both by individuals and by groups. The following resolution, passed at the 1957 annual meeting of the North Central States Branch of the ESA, is indicative of what is meant: "WHEREAS, there is a need for increased public recognition of Entomology as a profession BE IT RESOLVED, that the North Central Branch encourage and support the efforts of the standing committee of the Entomological Society of America on Training Standards and Status." This resolution was passed to the Committee with the request that the North Central Branch be notified if there was any way in which it could encourage and support the efforts of the Committee.

Similarly significant was the action taken this year by the Pacific Branch of the ESA. For 1958, the Pacific Branch had a special committee, chairmanned by John B. Steinweden, to study pest control legislation. This committee expressed a desire to encourage the work of the Committee on Professional Training, Standards, and Status and additionally, forwarded a copy of their report, with the statement that although the Pacific Branch as a whole is not interested in engaging actively in pest control legislation, it did believe that higher standards for applied entomology should be developed.

It is firmly believed that if the Committee on Professional Training, Standards, and Status is to eventually provide the services obviously expected by at least a portion of the membership, that the time is rapidly approaching when seminars, discussion periods, or similar means of face-to-face communication should be held on the subject of professionalism in entomology. It is only in this way that any logical and reasonable ideas can be developed as to what are the exact problems and needs of entomologists in the area of professionalism. An attempt was made to schedule a symposium on this subject for the Memphis meetings but was unsuccessful because of lack of program time. Because there continues to be great difficulty in scheduling all of the submitted scientific papers, it is believed that a discussion period on professionalism can only be held by planning it as an informal evening meeting. Accordingly, and in order not to delay this necessary beginning, it is requested that the Governing Board provide the Committee with its thinking and recommendations on this subject.

APOLOGIA

Because of various not-here-defined misadventures on the part of the Chairman, this "Report" is being submitted too late to permit obtaining comments, corrections, and/or additions from the Committee members. Accordingly, the list of names carried below is to be recognized as an expression of the membership of the Committee only and not an indication that they necessarily approve everything herein contained. However, such changes as are submitted to the Chairman prior to the consideration of this report by the Governing Board will be included in its formal presentation.

Respectfully submitted,
JOHN T. CREIGHTON
STANLEY B. FREEBORN
EUGENE J. GERBERG
RALPH E. HEAL
CHARLES E. PALM
KENNETH L. KNIGHT, *Chairman*

Governing Board Action

The Report was accepted.

RESOLUTIONS ADOPTED BY THE COUNCIL OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

30 December 1958

I. *Resolution on Parliament of Science*

The Council commends the Board and the special committee which arranged the stimulating Parliament of Science in Washington in March, 1958, pursuant to the Council's resolution in 1957, and notes with gratification that plans for further symposia are already well advanced.

II. *Resolution on Committees on the Social Aspects of Science*

The Council commends the accomplishments of the ad hoc committees on the Social Aspects of Science. They have had significant and beneficial effects on the understanding by scientists and by the public of the inescapable problems of adapting society to the age of science.

The Council has approved the Board's proposals to create standing committees to continue work in this area and will take special interest in their activities.

In order that the Council members and the affiliated societies may be kept fully informed of the thinking of these committees, as well as of formal Board actions resulting from their recommendations, the Council requests that the President arrange for the circulation to Council members of the special report of the Committee on the Social Aspects of Science issued after their June, 1958, meeting and of future reports of the three standing committees.

III. *Resolution on International Scientific Programs*

The success of the International Geophysical Year in correlating and integrating international scientific resources and extending the areas of cooperation and communication in science stands as a challenge to all other areas of scientific and cultural endeavor. This magnificent international effort is a fitting prelude to the "space age." The time is now ripe for world-wide attacks on other major problems.

The Council of the American Association for the Advancement of Science urges its affiliated societies, the Board of Directors, and appropriate committees to participate fully in appropriate international programs, for example, in such areas as the health sciences, outer space exploration, population problems, and social consequences of science.

IV. *Resolution on Dissemination of Council Resolutions*

The Council requests the President to send duplicate copies of resolutions passed at this meeting to each Council member, with the suggestion that these be submitted, if appropriate, to the affiliated societies for consideration along with an indication of action being taken to implement the resolutions, and with a reminder that Council members may submit appropriate resolutions originating in the affiliated societies for consideration by the Council or Board.

V. *Resolution on Agenda and Resolutions Committee for 1959*

Pending the report of the Committee on Council Activities and Organization, the Council requests the President to appoint a Special Committee on Council Agenda and Resolutions for 1959.

VI. *Resolutions on International Travel and Communication*

As indicated in the report of the 1958 Parliament of Science, "the pursuit of knowledge is an activity of the human race, not an activity of political subdivisions." History has shown that our country has gained greatly from the visits and collaboration of scientists from other countries.

The Council of the American Association for the Advancement of Science notes with gratification that changes in the U. S. passport regulations have improved international communication in science.

It is hoped that the issuance of visas and credentials may be further facilitated so as to permit the unimpeded travel of scientists throughout the world.

VII. *Resolution on Control of Nuclear Weapons Tests*

In the more than ten years of world-wide concern about the control of nuclear weapons and the exposure of human populations to increasing levels of radioactivity, scientists have carried a multiple responsibility. As scientists, it has been—and remains—our task to maintain the traditional devotion of scientific knowledge to the advancement of human welfare. This requires that the unprecedented power of nuclear energy be used for creative rather than destructive purposes. It is also our responsibility, through continuing scientific study, to extend our knowledge of the effects of radiation, including that from nuclear explosions, on human populations, and to explore techniques for nuclear controls. The reports of the United Nations Radiation Committee and the Radiation Committees of the National Academy of Sciences, which evaluate the known biological effects of radioactive exposure, and which recommend that all such exposures be kept at the lowest possible levels, represent major scientific contributions to the solution of this urgent problem.

It is our further task to help in the transmission and translation of this knowledge to the public, for the final and effective decisions on nuclear energy control must be made not by scientists alone, nor by the military, but by all citizens—and only an informed public can decide wisely.

The arena of decision now has moved to Geneva, where representatives of those nations which possess nuclear weapons are attempting to negotiate an international system to suspend the further explosions of such weapons. We believe that these negotiations represent a bright hope for the translation of scientific knowledge into effective public policy on a question which—literally—involves the survival of civilization. As both scientists and citizens, we have a deep concern with the success of the Geneva negotiations.

BE IT RESOLVED, therefore, that the Council of the American Association for the Advancement of Science express its profound hope that the Geneva Conference negotiations will prove successful.

The Council requests the President of the Association to transmit the sense of this resolution to the Geneva Conference through appropriate channels.

VIII. *Resolution on Federal Aid to Education*

The Council of the American Association for the Advancement of Science welcomes the National Defense Education Act of 1958 as further confirmation of the principle that the Federal Government should share in the responsibility for the support of education.

REPORTS OF REPRESENTATIVES TO SCIENTIFIC BODIES FOR 1958

REPORT OF THE REPRESENTATIVE ON THE COUNCIL OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

The last meeting of the A.A.A.S. Council (December 27–30, 1957) was reported by Dr. J. J. Davis and published in the BULLETIN OF THE ENTOMOLOGICAL SOCIETY OF AMERICA, June 1958, page 67.

The present report summarizes actions of the A.A.A.S. Board of Directors at its meetings March 16 and June 21–22, 1958, that may be of interest to the Entomological Society of America.

Meeting of March 16:

1. Elections of section officers were reported: Gordon K. Moe, Vice President and Chairman of Section N (Medical Sciences); Karl M. Wilbur, Secretary of Section F (Zoological Sciences); John W. Streeter, Secretary of Section L (History and Philosophy of Science).

2. Symposium volumes reported under consideration include the following approved for publication: Grasslands in our National Life, Origin and Affinities of the Land and Freshwater Fauna of Western North America, Evolution of Nervous Control from Primitive Organisms to Man; and the following being reviewed or edited: Physiology and Pharmacology of Fluorides, Biological and Chemical Control of Plant and Animal Pests, Low-Level Irradiation.

3. Expansion of the program of traveling libraries of science books on loan to high schools was recommended, this program being sponsored by the National Science Foundation. (At the June meeting of the Board the Executive Officer reported that the expanded program would include approximately 1,500 schools in 1958–59.)

4. The report on membership of the A.A.A.S. showed a net increase of 3,009 during 1957, the total membership reaching 55,727.

5. The Board requested the staff of the Association "to develop more systematic procedures for stimulating the nomination of Fellows in the Association." This action is of significance to the Entomological Society of America because some of its members in the A.A.A.S. are probably eligible for election to Fellowship but have not been nominated.

6. A change of the time of the annual meeting—from December to another time of the year—was discussed but the Board voted to continue the present schedule. Alternative dates suggested are already used for other scheduled scientific meetings.

7. It was reported that at the 1958 meeting in Washington the American Society of Zoologists will have one of its two major meetings of the year and the Society of Systematic Zoology will sponsor a program commemorating the Linnaean Centennial.

8. One representative from the A.A.A.S., with one each from the National Academy of Sciences and the National Science Foundation, will constitute a planning committee to select scientific advisors for the 1961 World's Fair at Seattle. The Fair will emphasize two themes, Pacific Rim nations and basic science. (Dr. Dael Wolfle represented the A.A.A.S.)

9. The financial report showed an income of $832,000 for 1957 and expenditures of $823,000 for the year. The net worth of the Association increased $40,000 during the year, the net worth at the end of the year being $1,276,000.

Meeting of June 21-22:

1. Most of the meeting was devoted to a review of Association activities, problems, and policies.

2. A report from the Committee on the Social Aspects of Science of its meeting at Princeton, N. J., May 30–31 and June 1, was read to the Board. It was tabled until a later meeting because the Board had not had time to study it.

3. It was reported that Dr. Leonard Carmichael, Secretary of the Smithsonian Institution, had accepted the general chairmanship of the Washington meeting, December, 1958. Plans were made to have the A.A.A.S. building open during all days of the Washington meeting so that members might visit the headquarters of the Association.

4. Because new hotel facilities in Denver will probably not be ready by December 1959 it was voted to change the place of the 1959 meeting from Denver, as planned, to Chicago. The following revised schedule of future meeting places was presented: 1959, Chicago; 1960, Philadelphia; 1961, Denver; 1962, Boston; 1963, Milwaukee.

5. Dr. Graham DuShane reported on the results of the merger of *The Scientific Monthly* with *Science*. He described the types of material now being published in *Science*. Those who had formerly received *Science* appear generally to be more pleased with the new arrangement than those who received *The Scientific Monthly*. The Board recommended that methods of further improvement of *Science* be considered.

6. A set of principles governing prizes and awards administered by the A.A.A.S. was established. These covered choice of field, eligibility and selection of recipients, and cost of administering.

7. One proposed symposium volume not included in the March report was described as being prepared for the printer: Photoperiodism in Plants and Animals.

8. The next meeting of the Board was scheduled for October 18–19, 1958.

Respectfully submitted,
GORDON ALEXANDER
E.S.A. Representative

Governing Board Action

The Report was accepted by the Board. See also the Report on page 67 of the June 1958 BULLETIN.

REPORT OF REPRESENTATIVE TO THE AMERICAN GRASSLAND COUNCIL

(Formerly the Joint Committee on Grassland Farming)

A general executive business meeting was held in Washington, D. C. on December 19, 1957. One of the important events of this meeting was the approval by unanimous vote of the change in name from "The Joint Committee on Grassland Farming" to "The American Grassland Council." This has been under consideration for several years and it was felt the name selected is more euphonious and fitting. Along with the name change a new constitution was proposed.

This constitution was discussed, revised and approved at a business meeting in Raleigh, North Carolina, on June 19, 1958. One of the significant changes in the organization is the establishment of a Board of Directors made up of a chairman, the elected officers of the Council and 18 Board members, 6 each from society representatives, representatives of industrial and business concerns, and from individual memberships. At this business meeting it was reported that 135,000 copies of the new eighth edition of "Grassland-Livestock Handbook" had been distributed. This makes a total of approximately 900,000 copies of this booklet distributed since the first edition in 1952.

It was also reported at Raleigh that two members of the research committee of the Council had appeared before the

House and Senate Committees on Agricultural Appropriations to discuss research needs. While results of this meeting cannot be easily determined, it was felt that considerable experience was gained on how to make future presentations.

The annual meeting of the Council was held on June 17–19, 1958 in conjunction with the American Dairy Science Association at North Carolina State College at Raleigh. Some very interesting papers were presented on forage quality and utilization. On June 19 there was a tour of several dairy and beef cattle farms to observe modern forage production and utilization procedures.

A business meeting will be held in Chicago on November 28 for the election of officers for 1959 by the 18 Directors selected by mail ballot. The Entomological Society of America representative was asked to serve as a member of the nominating committee for the Directors.

The next annual meeting will be held in conjunction with the American Society of Range Management at Tulsa, Oklahoma, January 27–30, 1959.

Respectfully submitted,
B. A. App,
E.S.A. Representative

Governing Board Action

The Report was accepted by the Board.

REPORT OF THE REPRESENTATIVE TO THE AGRICULTURAL RESEARCH INSTITUTE, NATIONAL RESEARCH COUNCIL

This representative attended most sessions of the 7th Annual Meeting of the Agricultural Research Institute held October 13–14, 1958 at the National Academy of Sciences in Washington, D. C. Two points were made which may well be given serious thought by our Society.

1. A speaker from the Foreign Agricultural Service, U. S. Department of Agriculture, discussing the training of foreign agricultural students in the United States, pointed out that these students are likely to learn only our technology. Upon their return home such specialists often are unable to apply their knowledge to existing conditions. This seems a serious indictment of our educational methods. The situation could be remedied considerably if teaching staffs in our colleges were to emphasize an interchange of ideas on problems their trainees will face. This might be an appropriate topic for a symposium sponsored by the Subsection on Teaching.

2. During a panel discussion of "Public Relations in Agriculture and Agricultural Research," representatives of agricultural research protested vigorously against the frequently derogatory remarks concerning this field in the public press. Some of the most broadly significant and newsworthy discoveries are made in the course of agricultural research with little attention from magazines and newspapers. On the other hand, nuclear research and space exploration receive disproportionate treatment. Press representatives promised, as one step toward remedying this situation, to try to obtain places on the programs of their national organizations for speakers in the field of agricultural research to discuss the improvement of public relations. This is in furtherance of the ARI aim "to develop an appreciation by the general public of the contributions that agricultural science and technology have made to the nation's health, economy, and standard of living." A similar activity by entomologists might be undertaken to improve press relations for entomological activities generally.

Respectfully submitted,
Harold H. Shepard
E.S.A. Representative

Governing Board Action

The Report was accepted by the Board.

REPORT OF THE REPRESENTATIVE TO THE DIVISION OF BIOLOGY AND AGRICULTURE, NATIONAL RESEARCH COUNCIL

The Annual Meeting of the Division was held at the National Academy of Sciences, April 1, 1958, as part of a general meeting of the members of the National Research Council held in Washington, D. C. on March 30 and 31, and on April 1. At the general meeting, problems of common interest to all Divisions of the Council, such as educational trends, IGY accomplishments, international aspects of science, stimulating research, and progress in cataloging and retrieving information, were discussed by speakers. These topics were further discussed in round-table conferences. Finally, the Divisions met separately for discussion of their own problems and activities.

One point informally discussed by the Division was the accreditation of colleges and universities by professional societies. The sentiment of the meeting was against accreditation; rather, it was felt that societies might properly recommend changes in curricula and educational standards.

Two important recent publications issued by the Division are "Improving College Biology Teaching" (Publ. 505, 70 pp.), and "Recommendations on Undergraduate Curricula in the Biological Sciences" (Publ. 578, 86 pp.). Since late in 1957 the Handbook office has been directed by Dr. W. H. Larrimer, who was well known as an entomologist prior to his work with and retirement from the Forest Service. The "Handbook of Insecticides" has been completed and awaits publication by Saunders. The "Handbook of Fungicides" is nearly complete. "Career Opportunities in Biology," a very successful publication of the now disbanded Biology Council, has been re-issued and is available.

On May 14–17, 1958, in Washington, D. C., there was held a symposium on "Possible Uses of Earth Satellites for Life Sciences Experiments," co-sponsored by the American Institute of Biological Sciences, National Academy of Sciences, and National Science Foundation. Through the Division, steps were taken to contact appropriate entomologists for attendance at the symposium, and several were among the several hundred persons present. Likewise of much interest to the National Academy of Sciences-National Research Council is the "International Conference on Scientific Information," to be held in Washington Nov. 16–21, 1958. The conference is concerned with problems of organizing and disseminating scientific information, with emphasis on the problems of storage-retrieval.

The Institute of Laboratory Animal Resources, an activity of the Division, has continued to be productive. One of its functions has been the occasional distribution of a mimeographed bulletin or news organ "Information on Laboratory Animals for Research." Several committees of the Institute are active.

Entomologists will be interested to learn that an insect physiologist, Dr. Dietrich Bodenstein, was elected to the National Academy of Sciences at the 1958 annual meeting of the Academy.

Primarily through the Executive Secretary of the Division, Dr. F. L. Campbell, your Representative has been called upon during the past year for several suggestions and nominations, which normally have been made after consultation with colleagues and with R. H. Nelson, Executive Secretary of the ESA. All ESA members are invited to bring questions or problems concerning the Division to the attention of the Representative.

Respectfully submitted,
Ashley B. Gurney
E.S.A. Representative

Governing Board Action

The Report was accepted by the Board.

REPORTS OF EDITORIAL BOARDS FOR 1958

REPORT OF THE EDITORIAL BOARD

ANNALS OF THE ENTOMOLOGICAL SOCIETY OF AMERICA

During 1958 the activities of the Editorial Board for the most part concerned review of manuscripts at the request of the Editor and of soliciting outstanding manuscripts for publication.

The Board is pleased to report that the ANNALS has appeared approximately on schedule and the present backlog of manuscripts is about that required to allow the Editor to keep copy available for the next number. Delay between acceptance and printing of an article continues to be no more than six or seven months, most of this being attributable to the time required for manuscript review and routine editing.

The Board has given favorable consideration to Dr. Hussey's suggestion that a Notes Section be established to carry the smaller papers that are now being submitted with greater frequency. Consideration is also being given to a proposal that a more specific policy be instituted regarding manuscript reviews. This would recommend that each article be seen by at least three impartial reviewers competent in the subject of the manuscript. Such review could provide a basis for critical selection of papers should the backlog of manuscripts again build up and threaten to cause undue delay in publication.

The Board feels that Dr. Hussey and the Executive Secretary's office are to be commended for having handled the operation of the ANNALS so successfully during the past year that there are currently no problems requiring consideration by the Governing Board. The Editorial Board does wish to express its appreciation for the favorable action taken on last year's recommendations.

Respectfully submitted,
J. J. PRATT
J. A. ADAMS
L. E. ROZEBOOM
M. H. HATCH
R. I. SAILER, *Chairman*

Governing Board Action

The Report was accepted by the Board.

REPORT OF THE EDITORIAL BOARD

JOURNAL OF ECONOMIC ENTOMOLOGY

This Editorial Board was available to Editor F. W. Poos for consultation and assistance throughout the year. The JOURNAL OF ECONOMIC ENTOMOLOGY has had another successful year. We have no special recommendations.

Respectfully submitted,
G. J. HAEUSSLER
D. E. HOWELL
R. L. METCALF
E. L. CHAMBERS
F. W. ARANT, *Chairman*

Governing Board Action

The Report was accepted by the Board.

REPORT OF THE EDITORIAL BOARD

THE THOMAS SAY FOUNDATION

During 1958 three manuscripts were brought to the attention of the Board for possible publication by the THOMAS SAY FOUNDATION. It appeared to be inadvisable or impossible to publish any one of these in 1958 and accordingly none was accepted.

A principal difficulty in the acceptance of manuscripts for publication is the high cost of printing in relation to the modest funds of the Foundation. The funds of the THOMAS SAY FOUNDATION have increased from approximately $3,200 to approximately $3,600 during 1958, however, and it is hoped that this increase will enable the Foundation to publish a volume during 1959.

Respectfully submitted,
C. W. SABROSKY
H. O. DEAY
L. F. CHADWICK
H. T. DALMAT
LOUISE M. RUSSELL, *Chairman*

Governing Board Action

The Report was accepted by the Board.

REPORT OF THE EDITORIAL BOARD

ENTOMA

The 12th Edition of ENTOMA was released during September, 1957, and as the 13th Edition will not be published until 1959, efforts of the Board were directed towards suggestions to the Editor, Dr. E. H. Fisher.

Two members of the Board and A. W. Lindquist, who represented W. C. McDuffie, met with R. H. Nelson during the meeting of the Pacific Branch of E.S.A. in San Diego, California, during June.

Several subjects were discussed:

1. How to build up sales. Are Extension Service people in all states contacted for orders?
2. Could the list of industry publications be expanded?
3. Increase in contribution of material by state collaborators.
4. Expansion of lists by states of airplane and ground sprayers and dusters as well as lists of pest control operators, exterminators, and fumigators.

The Board wishes to commend Dr. Fisher for his efforts as Editor and Business Manager of ENTOMA, as he is responsible for the splendid 12th Edition.

Respectfully submitted,
ROGER W. ROTH — J. W. APPLE
W. C. MCDUFFIE — M. P. JONES
JOHN B. STEINWEDEN, *Chairman*

Governing Board Action

The Report was accepted by the Board.

REPORT OF COMMITTEE ON INDEX TO THE LITERATURE OF AMERICAN ECONOMIC ENTOMOLOGY FOR 1958

Owing to the death of Miss Hawes there has been a very considerable delay in the development of indexes for 1956 and 1957. New personnel had to acquire familiarity with procedures and subject matter, and this has been somewhat slower than had been anticipated—due, however, not to lack of industry or competence on the part of the indexers, but rather to the steadily increasing volume and complexity of the work. In view of this delay it has been decided to combine the material for 1956 and 1957 in one index, which will be Index XVI. The indexing has been completed, and checking and editing are now in progress. It is hoped to have this volume ready for printing early in 1959. The indexing of the literature of 1958 has been proceeding normally and is nearly current. That has been made possible by the substantial financial assistance given by the Agricultural Research Service of the U. S. Department of Agriculture.

The Committee has recently reviewed the indexing program and has investigated changes that might be effected in order to bring the work within the scope of a single indexer. We have come to the conclusion that all practicable changes in procedures, even accompanied by rather severe cut-backs in coverage, could at best bring only a very temporary respite. Because of the steadily increasing literature and the growing complexity of it, particularly that dealing with insecticides, it is evident that the preparation of useful indexes will require the full-time employment of two indexers. The Library of the Department of Agriculture is already paying the salary of the principal indexer, and in addition it supplies office space and other facilities, together with considerable clerical and supervisory assistance. Its circumstances do not permit it to do more. Accordingly, it seems clear that if indexing of the literature of American economic entomology is to continue along present lines provision will need to be made for continuing indefinitely (after March 31, 1959) payment of the salary of an assistant indexer. Currently that salary is approximately $5000. per annum.

Respectfully submitted,
HELENE G. CUSHMAN
B. A. PORTER
C. F. W. MUESEBECK, *Chairman*

Governing Board Action

The Board accepted the Report. The Executive Secretary is to explore the possibility of obtaining the needed $5000.00 from the National Science Foundation.

GOVERNING BOARD ACTION RELATIVE TO ALL E.S.A. PUBLICATIONS

SCHEDULE FOR HANDLING MANUSCRIPTS TO BE PUBLISHED BY THE ENTOMOLOGICAL SOCIETY OF AMERICA

All manuscripts should be sent to the Office of the Executive Secretary where the following actions will be taken;

1. Acknowledgment of receipt and making of records for the Entomological Society of America office.
2. Determine membership status of authors.
3. Determine most suitable publication in which manuscripts should appear.
4. Request suitable abstract if one does not accompany each manuscript.
5. Determine probable excess costs for illustrations and tabular matter and advise authors thereof.
6. Record special requests of authors and/or their Agencies.

The following points distinguish between subject editing and mechanical editing:

Subject Editing

1. Obtain adequate reviews of manuscripts when and where necessary.
2. Resolve all correspondence with authors regarding acceptance of manuscripts, including revisions of and additions to each manuscript.
3. Edit for grammar and presentation (including arrangement) of data in accordance with the style used in the publication for which the manuscript is intended.
4. Edit references cited, using abbreviations of names of Periodical and Serial Publication Sources in accordance with lists provided by *Biological Abstracts*.
5. Edit common names of insects and of insecticides in accordance with lists approved by the Entomological Society of America.
6. Accept manuscripts in final form and forward to the Office of the Executive Secretary.

Mechanical Editing

1. Mark manuscripts for printer.
2. Mark illustrations for engraver.
3. Send galley proof, with original manuscript, to respective authors when this is not done by the printer.
4. Read galley proof for typographical errors.
5. Enter authors' corrections on editor's copy of galley proof and return to printer, with appropriate running heads, for page-proofing.
6. Check page proof when received from printer to see that corrections requested in galley proof have been made, and that no lines, paragraphs, footnotes, etc., have been omitted.
7. Forward abstracts to Biological Abstracts as promptly as it is appropriate to send them.
8. Handle book reviews and obituaries.
9. Prepare Volume Table of Contents and Volume Index.

REPORTS OF SPECIAL COMMITTEES FOR 1958

REPORT OF THE COMMITTEE ON MEMORIAL LECTURES

The undersigned were appointed by President Metcalf to the special *Committee on Memorial Lectures* to make recommendations for the first lecturer before the combined society. Suggested names of appropriate candidates were exchanged by correspondence between members of the committee. Attached is copy of the first memo of 28 January calling for suggestions and pointing out certain credentials to be kept in mind, including dedication of this first lecture to Dr. L. O. Howard, a past eminent member of this Society. Among the several worthy candidates under consideration, the name of Dr. Carroll M. Williams received unanimous choice. Accordingly letter of invitation dated 3 April was forwarded to Dr. Williams by Secretary Nelson, and fhe former accepted in reply of 18 April. The *Program Committee* had already (18 February) set a tentative time of 1:30–2:30 p.m., Wed., 3 December, at Salt Lake City for the lecture at a general session ahead of the business meeting.

Since there was considerable intervening correspondence with some items of responsibility in doubt, the files will be turned over to the succeeding committee, together with other names that were considered, for any guidance they may provide.

In letter of appointment, President Metcalf stated that he was authorized by the 1958 Governing Board of ESA "to appoint a committee to select a Memorial Lecturer for 1958 and to submit recommendation on such aspects of the memorial lecture proposals as may be referred to them by the president." On subsequent inquiry of the chairman to the secretary's office regarding specific duties and responsibilities, it was learned that the Governing Board endorsed the Report of the 1957 *Committee on Memorial Lecture*, to be continued by future Presidents "until the matter is resolved," and added a $100 honorarium with the hopes that some future sponsor could be attracted when the high stature of this annual lecture could be established. The Governing Board also accepted the recommendation that the first lecture be dedicated to L. O. Howard, but that future dedications be rotated among other worthy entomological pioneers.

Firmed guide lines for future committees can best be formulated after this first lecture. It is possible, however, to point out some uncertainties we have encountered. Will it be the continued policy to have the Secretary or the

President extend the invitation to the "recommendee"? Should an uninformed alternate be initially selected to save time in case of inability of first invitee to accept? What latitude in selection of topic, and in reference to memorialized person? Who decides on name for the next dedication? Though other Societies have similar lectureships, prizes, etc. (see quotation of the latest below), ours is the first one to try a rotation of this sort, and some pretty good heat could be engendered in a few years if succeeding names are not chosen with care; and how democratically? Perhaps the previous year's committee could make a recommendation to Governing Board after a year's thought on a suitable entomologist to memorialize for the year following.

Though last year's Committee recommended composition of each new Committee be appointive by the incumbent President, with the immediate Past President as chairman, this did not happen to be followed in case of this first functioning Committee. To have benefit of better continuity and experience, it is our belief that perhaps 2 members should carry over to the next year. It is imperative that the stature of these lectures grow, and not decline because of too feeble organization or superficial operation on a year to year basis.

Is the timing of delivery on a given program to be optional with the current program chairman and his committee? There is no criticism against this but it needs official guidance. In line with the dignity of a memorial lecture, there needs to be a decision on how and by whom the lecturer is to be introduced. For some awardees in other Societies, this is handled in bold type as a special feature, "blank presiding" (e.g. in this year's program at top of page 81, and not buried in small type as on page 99 or impersonally as on page 82). Also in line with attracting an eventual sponsor, publicity, if any, should not just happen, but be planned.

These are details for which there were no guide lines this year, and perhaps such questions cannot be judiciously decided even by this year's Governing Board before the first lecture has been given and reactions assessed. Please be assured that the above comments are offered only in a constructive, not critical, attitude toward present progress.

The latest example of several comparable awards established by other Societies, all in honor of permanently named individuals, is quoted from the October *Tropical Medicine and Hygiene News*. "The Society, [Am. Soc. Parasitol.] at this meeting, established a new award, to be given to a man or woman who has made significant contributions to parasitology during the first 15 years of his independent research career. The award will be named in honor of Henry Baldwin Ward and will consist of a gold medal and a cash award of $1000. The cost of the award will be borne by Parke Davis and Company." To offset an inherent weakness in our rotational plan of dedication by not being able to publicize the memorial lecture for the ensuing year at a given meeting, two suggestions have been made, (1) that this lecture be given a permanent title such as "Founders Memorial Lecture" and (2) that the person memorialized be selected 2 years in advance, necessitating the selection at Salt Lake City of memorial names for the 1959 and 1960 lectures and thereafter, for the second year after each annual meeting. This would allow announcement of at least the dedication of the following year's memorial lecture a year in advance with probable increased anticipatory interest among Society membership and even stimulation to achievement among younger members.

In this formative period, a formal type of report is hardly feasible, but your committee feels that a good precedent has been set for the maintenance of high and scholarly standards from both important points of view, (1) that of worthy dedication, and (2) that of a high caliber recipient of the award. If a medal is eventually attached to the award as previously recommended, your committee believes it would be only just to make it also retroactive to past lecturers beginning with this one in 1958.

R. C. Bushland,
H. G. Johnston,
H. H. Ross,
E. H. Smith,
C. B. Philip, *Chairman*

Governing Board Action

The Board accepted the Report. The Board by formal action directed that the 1959 lecture be in honor of Charles Valentine Riley and the 1960 lecture is to memorialize John Henry Comstock.

REPORT OF THE PUBLIC RELATIONS AND WELFARE COMMITTEE

The Committee met in Washington, D. C., July 15 and 16, 1958. It reviewed the activities and proposals made by last year's committee, as reported on pages 21–23 of the March, 1958, Bulletin, and recorded its unanimous endorsement of each item in that report.

The Committee noted with considerable satisfaction several members of the Society have been successful in obtaining publication of commendable articles designed to popularize entomology and promote a better understanding of man's relationships with the insect world.

Since the large national magazines are for the most part by prior actions committed to the exploitation of human fears, sex, and the fantastic speculative rumblings of pseudo-scientists, they no longer find the cold realities of life and of science interesting. Confronted with this fact, rather than yield to frustration and defeat, the entomologists and their associates in the allied biological sciences should and must concentrate their attention on the preparation of materials that can and will be accepted as feature stories by the daily and weekly press, specialized magazines, trade journals, and specific radio and TV outlets. To this end, the Committee recommends that a suitably qualified member in each of the 49 states be designated press and publicity agent and charged with the responsibility of stimulating interest in and the development of increased publicity that will not only bring credit to entomology, but also will enable the public to better understand and cope with our state and national insect control problems.

TheCommittee notes that through the cooperative efforts of many agencies, the public health aspects of problems related to insecticide usage have been reviewed and the conclusions drawn in each case were:

(1) The large-scale usage of pesticides in the manner recommended by manufacturers or competent authorities and consistent with the rules and regulations promulgated under existing laws would not be inconsistent with sound public health programs and the adequate protection of growing crops and livestock; and

(2) Although the careless or unauthorized use of insecticidal chemicals might at times pose potential hazards requiring further consideration and study, there was no cause for alarm.

Such encouraging conclusions notwithstanding, the very fact insecticides may and no doubt will be misused still remains a matter of some, if not, indeed, grave concern to a considerable segment of the American public.

The Committee is unanimously of the opinion by far the largest percentage of unfavorable publicity and adverse comment and criticism of entomology during the past year has to do with the hazards to, and in many cases the destruction of, wild-life associated with the inadvertent use of insecticide control measures lacking label approval. As Dr. Ira N. Gabrielson, President of the Wildlife Management Institute, pointed out in a recent address, "The

chemical companies are meeting a public demand and some of the larger firms are making efforts to minimize threats to wildlife. The major problem lies with the user, whether commercial contractor, governmental agency, or individual farmer."

It would appear our problems are largely educational in nature. Practically all of the unfortunate incidents that have occurred and tended to bring discredit on entomology could have been averted or avoided. To the end that the Society's position in this matter should be made clear, we would propose that the *Committee on Resolutions* might well consider the advisability of a resolution in essence comparable to those passed by the North Central and the Pacific Branches.

Respectfully submitted,

A. M. Boyce
H. M. Harris
L. D. Newsom
B. B. Pepper
G. C. Decker, *Chairman*

Governing Board Action

The Report was accepted by the Board. A resolution combining the ideas put forward, in the paragraphs numbered (1) and (2) with similar material from the Eastern Branch was handed to the *Resolutions Committee* with the recommendation that such a resolution be presented at the final business meeting.

REPORT OF COMMITTEE ON LOSSES CAUSED BY INSECTS

The committee held a full afternoon joint session with the Subcommittee on Insects of the Committee on Agricultural Pests, Agricultural Board, National Research Council-National Academy of Science, at Memphis, Sunday, December 1, 1957. All members were present. The objectives of the NRC–NAS committee project on losses caused by insects, plant diseases, weeds, nematodes and rodents were explained. The importance of having accurate indexes for evaluating losses caused by specific insect pests and the increasing need for documented data on losses based on research rather than on estimates were discussed. The committee noted the desirability of including among losses attributable to insects and related arthropods not only the direct loss through lessened yield and lessened quality brought about by pest attack, but also the cost of protective measures involving application of chemical control.

In general it was agreed that interests of the profession could best be served if direct loss attributable to insect attack were expressed in commodity units or in percentage figures rather than in monetary units. Total crop production plus losses sustained from all causes should be figured as the potential 100 per cent figure

It was felt that the committee could best progress toward attainment of its objectives by cooperating with the NRC–NAS subcommittee in promoting an awareness of the dearth of really reliable and documentable data on insect losses and by fostering a continuing program of encouragement of the development of projects specifically designed to yield loss data. A tabulation was made of major agricultural pests about which loss data may already be available in unpublished reports and project files as a result of previous research, and of workers who might presently be in position to bring such data together for publication. Members of the committee agreed to contact designated workers and to encourage them to organize and summarize these existing data and to develop new research projects designed specifically to yield more accurate data on losses. As evidence of efforts to stimulate interest, the committee notes that a number of state and federal workers have agreed to undertake to bring together for publication information on one pest or another. Several such papers will be presented at this, the Salt Lake City meeting, and it may be anticipated that additional papers will be presented at each of the coming Branch meetings, with a marked increase in number at the next annual meeting of the Society. Also, research projects in a number of states have been modified or in some cases newly developed with the objective of obtaining more accurate data on losses than we have had in the past.

The committee conceives its functions to be long-range in nature and its task thus to be a continuing one. Any success it may achieve will become evident only as additional workers are brought into its sphere of activity. In order to involve more and more workers toward the achievement of the objectives of the committee, steps have been taken toward the development of parallel committees in each of the Branches of the Society.

Respectfully submitted,

W. G. Eden
J. C. Gaines
L. G. K. Iverson
W. E. McCauley
J. E. Swift
H. H. Harris, *Chairman*

Governing Board Action

The Report was accepted by the Board with a recommendation that the committee be continued.

REPORT OF THE COMMITTEE ON MICROCARDING OF SOCIETY PUBLICATIONS

Recommendations

1. Complete sets of back issues of the Journal of Economic Entomology and of the Annals of the Entomological Society of America should be microcarded. Not to exceed 15 sets of each should be made initially. These should be offered for sale as complete sets only. Later, perhaps, cards representing parts of sets, volumes, issues, or single articles may be made and sold.

2. Beginning, if justified, with the first issues of both journals for 1960, each issue should be microcarded as it appears. Members and non-member subscribers would have the option of receiving these cards with each issue at the necessary additional cost.

3. Whenever the editor of either journal finds it necessary to reject a worthy manuscript because of its length, or to suggest omission of details, or whenever he finds that his backlog of unpublished manuscripts is becoming dangerously large, it will be time to initiate supplementary publication of original material on microcards, such cards to be sold only to those who order all such supplementary material or who order cards pertaining to specific papers in either journal.

Introduction

In his letter of March 10, 1958, to Frank L. Campbell President Robert L. Metcalf asked him, Frederick W. Poos, and George E. Bohart to "consider the possibility of a microcard edition of the Journal of Economic Entomology." Later, in ESA Letter No. 3 to Members of the Governing Board, October 14, 1958, this committee was asked to report on a broader topic; i.e., "Microcarding of Society Publications." The latter will be done below.

Campbell, Poos, and Bohart had one luncheon meeting on this subject. Later Campbell consulted Gerald L. Sophar, Washington representative of The Microcard Corporation, about the cost of microcarding back issues of the Journal and of the Annals. Finally, after another conversation with Dr. Poos, the present report was written by Campbell, who does not guarantee that it represents accurately any views other than his own.

The Purposes of Microcarding

The microcarding of Society publications is worth considering because microcard reprints or publications can reduce costs of Society services to members in the dissemination of the results of entomological research. Also microcards are easier to store, catalogue, and transport than are books, journals, and reprints and therefore can form convenient mobile libraries for specialists, readable wherever there is a dissecting microscope or a microcard reader.

Our subject may be divided into three aspects in each of which factors of cost and convenience apply in different degrees:

1. The microcarding of back issues of both journals
2. The microcarding of each issue at the time it is printed
3. The microcarding of typewritten material, tables, or illustrations supplementary to articles published in either journal.

The Microcarding of Back Issues

If all the back issues of the Journal and the Annals were in commercial storage, it would be easy to show the saving in rent that would follow conversion of that bulk to microcards. At present, however, one cannot argue that all back issues ought to be replaced by microcards of the same, because the former are stored free of charge. When and if the Society must pay for this storage, it would be worthwhile to study demand for back issues with respect to time, i.e., to determine trends in order to decide whether it is really economical to keep indefinitely every back issue on hand or whether the Society could reduce long term costs by discarding the bulk and replacing it by microcards of these issues. If complete sets of the Journal and Annals are becoming scarce, we suggest that the Society's first venture in microcarding be the preparation of 15 complete sets of each journal through volume 50. According to Mr. Sophar this would cost $96 per set for the Annals and $168.30 for the Journal. The total cost would be $3964.50, which would be recovered by the sale of these sets to libraries. Once these back issues have been microcarded, the Society will be permanently protected against loss of any part of its research record and will be in a position to microcard again all or part of this record as the demand may require.

Let us suppose that conventional reprints of certain popular papers have been exhausted but the demand continues. The Society could offer to supply these reprints in microform merely by providing the cards on which the desired pages appear. The cost per card would be so low that an individual could well afford to buy pages that he does not want in order to get the pages that he needs. For this reason it would seem desirable always to end an article on the card on which it begins. This would be impossible only if the number of pages in an article should exceed the number (39 in present format) that a card can carry. If this were done, however, the numbers of cards that would be required for all back issues would exceed the number estimated by Mr. Sophar (549 for the Annals and 939 for the Journal) and the cost of production would be greater than that given above. Having no idea of existing or potential demand for microcard reprints of this kind, we are inclined to recommend that the maximum number of pages be put on each card. Occasionally, therefore, the microcard reprint collector would have to buy two cards per reprint instead of one.

The Microcarding of Current Issues

If a "market survey," which we have not had time to make, indicates that our non-member subscribers would welcome a microcard edition of the Journal and Annals, then arrangements should be made with the Microcard Corporation to provide it. From three to five cards would be required per subscriber for each issue, and it should be feasible to avoid splitting an article between two cards. The cards would be sent to each subscriber, whether member or non-member, by the ESA office to coincide with the delivery of the Journal or the Annals. The charge for this service can be made to exceed the cost of providing it, as is true of our conventional reprint business. The service can be expanded to meet whatever demand may develop for it and the cost per card will diminish as the numbers increase, as shown in the following price list:

New Work		*Reprints*	
Prints per Negative Number	Price per Print Cents	Prints per Negative Number	Price per Print Cents
15	17.5	15	12.5
25	13.5	25	11.0
35	12.5	35	10.5
50	11.0	50	10.0
75	10.0	75	9.5
100	9.5	100	9.0
250	8.0	250	8.0
500	7.5	500	7.5
1000	6.5	1000	6.5

As entomologists become aware of the advantages of microcard libraries they may wish to purchase microcard reprints of their articles in addition to or in place of conventional reprints. This development, which will take place slowly, if at all, should not be regarded as a threat to the Society's profitable reprint business. Since the cards will be sold by the Society, whatever mark-up seems reasonable and necessary can be applied. Again, we think of a microcard reprint of an article as a card of an issue in which the desired article appeared. For visual indexing the subject or author heading can be typed on the back of the card together with the complete reference, and the beginning and end of the article concerned can be marked by hand on the face of the card. An ordinary hand lens will serve for finding the article on the card. If more than one article on a card is wanted by the reprint collector, it would be well for indexing purposes to get at least one card for each article desired.

It may be desirable to point out here that the microcard is not now the sole or even the best answer for the reprint collector who wants to assemble a special library in microform. If he should depend on microcards alone, he could conceivably have a microcard made of any published article he could procure. But to have a negative made for only one or two prints and to cover only a small part of a card would be expensive and wasteful. We believe, however, that the 3x5 file is an excellent foundation for the special microform library, which could consist of microcards whenever they can be obtained inexpensively and of 3x5 frames or cards on which microfilm or microtape can be mounted. It is possible for the collector to take his own micro-pictures inexpensively and mount and index them. In this connection we append a letter from G. E. Bohart to Leland R. Brown, which contains some interesting ideas.

The Microcarding of Original Material

Entomologists should become accustomed to microcards as proposed above before any attempt is made to save money or to expand the content of research reports by publishing large parts of them on microcards directly from typescript and from original drawings or photographs. However, this kind of publication is so sensible that the writer of this report could not refrain from mentioning it as a development that will be the answer to excessive publication costs, time lag, and desiccation of detail.

It is proposed simply to publish the results of each investigation in the conventional manner in the Journal or the Annals, but without the details that a specialist would require for evaluation and duplication of the work. These details, with all desired tables, figures, charts, and photographs, would be published on microcards in a relatively small edition calculated to supply the demand of all

specialists and libraries. Reference would be made in the JOURNAL or ANNALS to microcard supplements, which could be purchased from the office of the Society. Unfortunately this system cannot yet be applied to publication of descriptions of new species of insects, but there are plenty of other kinds of investigations in which supplementary publication is possible and desirable.

We recommend that the Governing Board see to it that the Managing Editor of the Society's publications takes an active part in the Conference of Biological Editors where new ideas are emerging on unconventional publication. In particular, the Editor should watch the performance and acceptance of the new journal of the Wildlife Disease Society, the first journal to be published on microcards.

The general recommendations of this report are given on the first page, as suggested last year by President Armitage.

GEORGE E. BOHART
FREDERICK W. POOS
FRANK L. CAMPBELL, *Chairman*

Appendix on Special Microform Libraries

April 30, 1958

Dr. Leland R. Brown
Asst. Professor of Entomology
Department of Entomology
University of California
Los Angeles 24, California

Dear Dr. Brown:

I was interested in reading about your system of maintaining a personal literature file composed of kodachrome slides. It is one with certain advantages, especially if the total volume of literature is not very large. It seems to me that the principal advantage is that you can take the pictures at once as you see the articles in which you are interested. Of course, the use of color is an advantage where color illustrations are concerned, but colored illustrations in entomological works are quite a rarity.

My line of thinking still leans toward a combination of microcard and microtape techniques. Microcards can be obtained in lots of 5 for about 40¢ apiece. If the article runs 3 pages the cost per page would be between 10¢ and 15¢. Obviously the cost per page would go down rapidly to a minimum of about 7¢ per page for longer articles and go up rapidly to a maximum of 35¢ to 40¢ for shorter articles. For lots of 25 the cost per card is about 18¢ and for lots of 50 or more it is about the same as your cost for kocachrome slides. Naturally the individual literature collector has little use for more than one card containing the same material unless he is going to embark upon an ambitious and time-consuming trading program. However, it seems to me that, since most entomologists are specialists in one or only a few fields and usually limit their literature to their own specialities and keep in correspondence with other specialists in the same fields, they could form groups for the purpose of ordering enough cards to go around and thus greatly reduce the cost. Different members of the group could be assigned different journals, etc. I have a feeling that for the 25 or 50 persons in this country actively interested in Apoidea such a system would work out very well.

For those who need the greatest economy with relatively little sacrifice in time or fileability, microtape could be used for shorter articles. These could be pasted on blank cards or on microcards as additions to closely related literature already microprinted on them.

The microcard idea should work out very well for having entire literature collections in a specialty reproduced with enough copies to go around to all specialists in the same field. This would be particularly valuable for the younger men who are starting to build up their literature or for those who are not close to good library facilities. A large literature collection with an average of 10 pages per article could be handled at surprisingly low cost per subscriber if 50 copies were distributed. For example, a collection of 2,000 articles with an average of 10 pages per article could be microcarded for about $240.00 or 1.2¢ per page.

Another advantage to the microcard is that each card can function as its own reference card. There is thus no need for separate card and literature files unless a cross-indexed author and subject system is used. In this case only 1 set of cards in addition to the microcards would be needed. Most people in thinking about microcards are very concerned about the problem of readers. However, for the average entomologist this is not too much of a problem. He usually has ready access to a dissecting microscope which makes quite a satisfactory reader.

Of course, the big advantage you have with your system is that it is already in operation and functioning well enough for your purpose, whereas most of us are merely turning over various ideas in our minds.

Sincerely yours,
G. E. BOHART

Governing Board Action

The Report was accepted by the Board. The Board recommends that the present committee continue their study of the matter as they have the situation in hand.

REPORT OF THE COMMITTEE ON NEW ESA PUBLICATION SERIES

Recommendation 3 of the 1957 report to the Governing Board of the temporary Committee on Editorial Policy and Procedures was as follows: "That a new MISCELLANEOUS PUBLICATIONS be established to appear on an irregular basis as dictated by demand."

The predominant reason for the development of this recommendation was the belief that it is a fundamental responsibility of the Entomological Society of America to publish significant contributions to the knowledge of entomology. Presently, the Society is unable to accept, for publication, papers dealing with aspects of fundamental entomology which are of immediate interest to only a limited number of readers and which are longer than 20 printed pages (the present upper limit acceptable for publication in the ANNALS) but too short for consideration by the THOMAS SAY FOUNDATION. Such papers are most generally taxonomic studies, but ecological, physiological, morphological, biological, and review studies may all also occur. Production of the proposed MISCELLANEOUS PUBLICATIONS would provide a source for these types of papers.

The 1957 Governing Board approved the recommendation quoted in the first paragraph, and furthermore, authorized the President to appoint a *pro tem* committee to take such steps as are necessary to get the new publication started. Furthermore, the Board earmarked the sum of $3,000 in the 1959 budget to be used for financing the initial phases of the new project, contingent upon the approval by the membership of an increase in dues for 1959. These Board actions were later approved by the membership in open meeting and subsequently, a majority of the membership approved the increase in dues by mail ballot. On 22 January 1958, President Robert L. Metcalf appointed Leigh Chadwick, Paul Oman, and Kenneth L. Knight (*Chairman*) to this committee.

The first step taken by this Committee was to produce a specification for the new publication. This specification is reproduced here as Appendix I.

In August, 1958, following receipt of the information that the membership had approved the dues increase, Mr. R. H. Nelson and the Chairman met with Mr. I. H. Chamberlain of the Horn-Shafer Company, 531 West Pratt Street, Baltimore, Maryland. This company publishes the

B & Z Library

BULLETIN of the ESA. At this meeting, arrangements were made for Horn-Shafer to print the new publication series.

On 6 and 25 August, 1958, news releases on the publication were prepared and submitted to Mr. R. H. Nelson for distribution through every publicity source available to him.

It is contemplated that the present *pro tem* committee will serve as a *pro tem* editorial board for the new publication until a duly constituted editorial board can be established by the 1958 Governing Board. It is further contemplated that Dr. Poos will provide editor services until such time as a full time managing editor is employed by the Society.

Because of the sliding scale used in computing publication costs (i.e., variation based on number of pages and number of copies printed), it is not possible to determine the exact cost to the Society of printing the first volume of 200 pages. However, it is estimated that a mimimum of $5000 will be required for this purpose. One thing that should be borne in mind is that Horn-Shafer has promised better rates and services than any of the other companies investigated.

In order to permit the most adequate consideration of manuscripts submitted, it is recommended that an Editorial Board for the MISCELLANEOUS PUBLICATIONS be approved at this time. It is felt that the Editorial Board should have a membership intermediate to that of the JOURNAL and of the ANNALS, i.e., one member each from Sections A, B, C, D, and F, since any of these Sections will conceivably produce manuscripts suitable for MISCELLANEOUS PUBLICATIONS. Term of membership should be for five years, with one member being replaced each year. To get this rotation started, it is suggested that on the initial Board the Section A individual serve for five years, the Section B man for four years, Section C for three, Section D for two, and Section F for one. It is further recommended that the Sections be asked to select their members for this Board during the Salt Lake City meetings, so that the Board can be immediately constituted.

Concerning editorial policies, including instructions to contributors, etc., it is recommended that all policies currently applicable to the JOURNAL and the ANNALS also apply to the new series.

If financial considerations are excluded, the principal problem with the new publication will be that of screening manuscripts in such a way that unnecessarily long papers, or ones without much permanent value, are rejected without creating harmful ill-will. Financial considerations will not permit the unlimited publication of manuscripts in this publication series, as is the case with the JOURNAL and ANNALS. Rather, once the membership begins to submit manuscripts to this publication, it will be necessary to be selective, quality wise, of manuscripts, if more pages are not to be published than can be afforded.

Respectfully submitted,
LEIGH E. CHADWICK
PAUL W. OMAN
KENNETH L. KNIGHT, *Chairman*

Appendix I

SPECIFICATION FOR NEW ESA PUBLICATION SERIES

Title. "MISCELLANEOUS PUBLICATIONS OF THE ENTOMOLOGICAL SOCIETY OF AMERICA."

Purpose. To provide an ESA publication medium for manuscripts too long for use in the JOURNAL or the ANNALS and not of a type or size suitable for inclusion in the THOMAS SAY FOUNDATION series. Basically, this new medium will only publish manuscripts of greater length than 20 printed pages. Subject matter is limited only in that it must be entomological. Review-type articles of unquestionable value and not constituting a duplication of material planned for the Annual Reviews will be eligible for consideration.

Initiation. Contingent upon approval by the membership of the ESA of an increase in dues for 1959 (to be determined by mail ballot in April 1958), this new publication will be officially initiated in January, 1959.

Handling. The 1958 pro tem committee will serve as the editorial board until the establishment of an official editorial board and the designation of a technical editor at or following the 1958 annual meetings.

Initial Volume. The 1959 volume will consist of approximately 200 printed pages, with a subsequent expansion to an annual volume of 500 printed pages planned for an eventual goal. The 1959 printing will consist of 1,000 copies of each number, unless advance sales of any copy indicates the need for a greater number. Of these 1,000 copies, 250 shall be held in storage for later filling of complete sets for institution libraries.

Publication Type. This new series will consist of individual articles (numbers), issued when printed, but with a continuous annual pagination. If required for convenience, to meet postal regulations, etc., the Executive Secretary may hold numbers until predetermined dates for mailing to the annual subscription list. Numbers purchased either by advance or subsequent sales will be mailed when ordered and paid for.

Printing Method. To be printed by the letterpress method, provided the printer will agree to hold pages in made-up form for a period of at least one year (to provide for the ready reprinting of any number that develops an unexpected "sales appeal"). Page makeup and type size to be as used in the JOURNAL. Four page signatures. Tail page or pages blank if size of number requires. All numbers to have covers (saddle sewn) except for reprints, where covers will be an additional cost at the author's option.

Reprints. Reprints will be limited to 100 copies per article and will be priced so as to secure a small profit for the Society.

Price. The first volume will be priced at $10.00 for nonmembers and $6.00 for members. Prices for each individual number to be established by the Executive Secretary based on the number of pages contained; to be higher than the cost of author's reprints and when totaled for all the numbers of the volume to slightly exceed the subscription cost of the volume. If feasible, a reduced price should be established for sales of more than a single copy of a number much as is done with reprints.

Announcements. A prepublication notice for each number will be placed in the Bulletin along with the sales price.

Speed of Publication. The time between acceptance and appearance of an article should be not more than six months.

Paid Papers. The payment of printing charges by the author is to be given fullest encouragement.

Governing Board Action

The Report was accepted by the Board. The officers of Sections A,B,C,D and F were requested by the Board to elect members to a MISCELLANEOUS PUBLICATIONS Editorial Board as recommended in the Report. The members of this Editorial Board are listed elsewhere in this issue of the BULLETIN.

REPORT OF EXHIBITS COMMITTEE

Introduction. Initial response to circulars sent out to potential exhibitors in the spring of 1958 was very slow. There was, however, a last minute flurry of activity in the month preceding the meetings. As a result, there was a good group of exhibits when the meetings convened on December 1. These were comprised of 8 commercial ex-

hibits, 9 educational exhibits, and 4-H Club exhibits from 10 states. This compares with 8 commercial exhibits, 10 educational exhibits, and 4-H Club exhibits from 10 states at the 1957 meetings.

Commercial Exhibits. The ten commercial exhibitors were as follows:

1. E. L. Bruce Company, Attention Harvey Creech, 1648 Thomas Street, Memphis, Tennessee.
2. California Spray-Chemical Corp. Attention Blaine C. Taylor, P. O. Box 2070, Salt Lake City 10, Utah.
3. Shell Chemical Corp., Attention John G. Likakis, Advertising Dept., 50 W. 50th Street, New York 20, N. Y.
4. B & G Company, Attention William L. Brehm, Plumsteadville, Pennsylvania.
5. Gandy Company, Attention Charles H. Starker, 100 Gandrud Road, Owatonna, Minnesota.
6. F. E. Myers & Bro., Attention J. M. Kelly, 249 Orange Street, Ashland, Ohio.
7. Lester W. Hanna, Agricultural Enterprises, Route 1, Box 210, Forest Grove, Oregon.
8. Encyclopedia Britannica, Inc., District 221, Salt Lake City, Utah.

Educational Exhibits. The nine educational exhibitors were as follows:

1. U. S. Dept. of Agriculture, Attention E. P. Regan, Director, Plant Quarantine Division, Agricultural Research Service, Washington 25, D. C.
2. Department of the Air Force, Attention Capt. Warren F. Pippin, OIC, Medical Entomology Section 3882d School Group, Gunter AFB, Alabama.
3. U. S. Dept. of Agriculture, Attention R. A. Fulton, Entomology Research Division, Agricultural Research, Beltsville, Maryland.
4. American Mosquito Control Association, Attention T. G. Raley, Executive Secretary, P. O. Box 278, Selma, California.
5. U. S. Public Health Service, Attention Cornelius B. Philip, Rocky Mountain Laboratory, Hamilton, Montana.
6. 4-H Club Demonstration Booth, Dr. H. Eldon Scott, Department of Entomology, North Carolina State College, Raleigh, N. C.
7. Insecticide Reference Standards Committee, Entomological Society of America, Attention Frank W. Fisk, Dept. of Zoology and Entomology, Ohio State University, Columbus 10, Ohio.
8. Pan American Sanitary Organization, 1501 New Hampshire Avenue, N.W., Washington 6, D. C.
9. North Carolina State College, Attention H. Eldon Scott, Department of Entomology, Raleigh, N. C.

4-H Club Demonstrations. The 4-H Club exhibits were placed in the main lobby of the hotel. They drew particular attention and much favorable comment. The following states were represented by exhibits:

Arizona	North Carolina
Georgia	Oregon
Idaho	Utah
Michigan	Washington
Mississippi	Wyoming

In addition to the above, Dr. Eldon Scott of North Carolina brought a team which gave a very fine demonstration on wire worm control.

Each 4-H Club member participating in the exhibits will receive an engraved certificate from E.S.A.

Financial Statement. Total receipts were $770.00, total expenditures $557.00 and net profit $213.00.

Respectfully submitted,
W. M. Rogoff
Harrold B. Jones
Harry L. Haynes
Dial F. Martin
G. F. Edmunds, Jr.
A. D. Hess, *Chairman*

REPORT OF THE COMMITTEE ON ENTOMOLOGY IN OUTERSPACE

On July 11, 1958, Dr. Robert Metcalf appointed me as a special representative to explore the possibility of the use of Insects as Biological Indicators In Space Travel.

Since then, I have contacted a number of workers in the field of space aviation to gather information and ideas.

It quickly became evident that there are three (3) types of interested and active groups.

1. Aviation Industry.
2. Biological disciplines including Aviation Medicine and Human Factor.
3. Government agencies.

The aviation industry is mainly interested in hardware in regard to radiation and thermal shielding. Shielding, of course includes safety for the crew. That is why they include on their staff Aviation Medicine and the Human Factor groups.

In the vast field of Biological Disciplines there is a wealth of information on radiation and thermal tolerances and effects on humans, but it is not directly geared to outerspace travel.

This is simply because this is a new subject and our information about the activities in outerspace is fragmentary. It is of the utmost importance to know the exact type of radiation in the Van Allen ionosphere.

It is hoped that this information would be available within eight to twelve months, i.e., when data from Explorer IV, and others to come, will have been analyzed.

The Government Agencies have not yet formulated an Integrated National Plan for outerspace studies. In any discussion we attended, the question invariably asked was: "who is working on what, where and why?"

A glance at the U.C.L.A. School of Medicine's Atomic Energy Project: Report on Contract No. AT-(04-1) GEN-12; and also a glance at Holloman Air Force Base's booklet, entitled "Major Achievements in Space Biology, 1953–1957" will show what was done and what plans one branch of the Government is trying to do.

What is needed, I believe, is a cooperative program of study to include the efforts of Biological research of various disciplines, The Aviation Industry Researchers, and the Government Military and civilian Scientists.

A modest outline is suggested in a memo from Dr. Armstrong to Dr. Malley. Here it is suggested, along lines discussed with President Metcalf, that Biological Indicators be selected to test against radiation encounterable in Outerspace Travel. The sensitivity data would be tabulated in an ascending order of biological material. Aviation Industry requires this information to build shielding structures adequate for the safety of the crew.

I am sure that there are other ideas and areas that can be proposed; for instance symbiosis and metabolic waste product disposal studies, in the order of the current work of Dr. Jack Myers, University of Texas, Austin, Texas. I am sure there are other possibilities. Convair key personnel seemed eager to accept the concept of joint efforts with other Scientific Institutions, Biological and otherwise.

With this thought as background I organized a delegation from Convair, San Diego, to visit the University of California School of Me licine at Los Angeles. This delegation was unofficial and was headed by Dr. A. Small, with members from Aviation Medicine, Dr. R. Armstrong, and Convair Scientific Research Laboratory.

These conferences with U.C.L.A. were held during October and November, 1958.

As a result of these visits, we suggested to Convair Management the following:

1. A radiation panel be set up for all Convair Divisions to formulate policies, and in the meantime,
2. An Informal Liaison by Convair be maintained with the U.C.L.A. people to keep abreast of the latest developments in this field.

I shall endeavor to pursue this activity, and if it pleases the Governing Board, I shall keep you informed.

I will also be very happy to continue to serve in my present capacity as official Representative or member of a special committee.

I believe our Society should take a leading role in the Nation-wide joint effort with other Biological Societies and Institutions to promulgate a National Plan of Research for Outerspace Travel.

Therefore Mr. President, I move that the following resolution be adopted:

BE IT RESOLVED:

A standing committee be established to foster and coordinate ways and means of the Entomological Society of America's participation in promulgating a National Research Program for Outerspace Travel.

This committee shall be composed of not less than three (3) members and not more than five (5) members, one of whom shall be from Aviation Industry, preferably an Entomologist.

Respectfully submitted,
NURI MALLEY

Governing Board Action.

The report was accepted. The committee is to be continued as a Special Committee.

REPORTS OF SPECIAL REPRESENTATIVES AND DELEGATES FOR 1958

REPORT OF REPRESENTATIVE AAAS-CAMPBELL AWARD FOR VEGETABLE RESEARCH

The undersigned served as representative of the Entomological Society of America on the committee established to judge nominations for the AAAS-Campbell Award for Vegetable Research. This annual award, established in 1957 by the Campbell Soup Company and consisting of $1,500 and a bronze medal given for an outstanding single research contribution of either fundamental or practical significance relative to the production of vegetables for culinary use, is administered by Section O—Agriculture of the AAAS. The Committee of seven judges is under the chairmanship of Dr. Louis P. Reitz, Beltsville, Maryland.

As the committee was not established until very late in 1957, it was not possible to publish a notice of the award in the BULLETIN OF THE ENTOMOLOGICAL SOCIETY OF AMERICA. Arrangements were made, however, for Mr. R. H. Nelson to bring a notice of the award and an invitation for submittal of nominations to members of the governing board and the chairman, vice-chairman, and secretary of each of the Branches in order that they might help bring the matter to the attention of Association members. The chairman of the award committee also brought the matter to the attention of all experiment station directors.

From the 15 nominations submitted, only 1 of which had any relation to the subject of entomology, the judges chose a "team" contribution by Drs. S. H. Wittwer and F. G. Teubner, Michigan State University Horticulturists, for their work on flower formation and fruiting in tomatoes. The recipients received the joint award at the AAAS annual meeting at Indianapolis, Indiana, on December 30, 1957.

The undersigned has continued to serve as representative of the Entomological Society of America on the award committee for the current year. An invitation for submittal of nominations for the 1958 award appeared on the inside front cover of the BULLETIN, Vol. 4, No. 3, October 1958.

Respectfully submitted,
G. J. HAEUSSLER
E.S.A. Representative

Governing Board Action

The Report was accepted by the Governing Board.

REPORT OF DELEGATE TO THE COLLOQUIUM ON ZOOLOGICAL NOMENCLATURE AND THE XVTH INTERNATIONAL CONGRESS OF ZOOLOGY

Herewith a brief report as one of the delegates of the ESA to the above meetings. I have also received a copy of a report by Dr. C. B. Philip. It occurs to me that Dr. Usinger, as Chairman of the Nomenclature Committee of the Society, should really be the principal reporter, and that he might codify our several reports into a formal report, if it desired to have one for publication.

The main object of attention by the entomologists was the nomenclature meeting, including both the Colloquium and the Section on Nomenclature of the Congress. The main goal of these meetings was the finalizing of an International Code of Nomenclature on which work had been done at Paris (1948) and Copenhagen (1953). Over 200 zoologists and paleontologists were officially registered for the Colloquium. Attendance at sessions ranged from about 100 to 150, including 35 to 45 Americans. Registrants included at least 49 entomologists, of which 13 were North American. Ten of the latter are members of the ESA, and one of our members, Prof. J. Chester Bradley, is President of the International Commission on Zoological Nomenclature. Sessions of the Colloquium lasted for 7–8 hours a day for 8 days, plus one long day of the Section on Nomenclature. 19 of the 25 members of the International Commission were present at the meeting.

I attended all sessions of the Colloquium and Section, and was Chairman of a Coordinating Committee that worked throughout the Colloquium and Congress to coordinate and edit its decisions and to prepare a final draft Code for its report. In addition, I was present at two long evening meetings of the Commission, as an Alternate. At the end of the Congress, I was appointed as one of two American members of a six-man Editorial Committee to give final review to the drafted text of the new Code prior to formal approval by the Commission. It is hoped that the Code will be published within six months, although this may be wishful thinking.

The Code itself, when available, will be a complete report on what was done, and it is impossible to enumerate here all the many decisions that made up the work of the Colloquium and Section. A list of major decisions and some on particularly controversial matters will appear soon in a December News-Letter of the Society of Systematic Zoology. Probably the most controversial was passage of a "Statute of Limitations" on the Law of Priority, that

nullifies priority for names "unused in the primary zoological literature" for fifty years or more. American entomologists in general will find this highly objectionable, I believe. Our problems are magnified in difficulty, compared with other branches of zoology, because of the great number of genera and species with which we have had and will have to deal. It may be that objections will be great enough that we should take exception to that portion of the Code, and perhaps one or two other serious but less important sections, as they apply to the field of entomology.

Respectfully submitted,
CURTIS W. SABROSKY
E.S.A. Delegate

Governing Board Action

The Report was accepted by the Governing Board.

REPORT OF DELEGATE TO XVTH INTERNATIONAL CONGRESS OF ZOOLOGY, LONDON, 16–23 JULY 1958

This delegate arrived in London on 10 July, the day after convening of the Colloquium on Zoological Nomenclature, and was able to attend most of those sessions thereafter. Other delegates of ESA, Usinger, Sabrosky and Gressitt, to the Colloquium accomplished attendance at all sessions and/or were also active in subsidiary committee work from whom a more complete report on deliberations important to entomologists can be expected. The recommendations of the Colloquium regarding a revised Code were mostly adopted by the Congress in principle, subject to revision "not of substance" by an interim editorial committee consisting of N. D. Riley, C. W. Wright and *ex officio* R. V. Melville (international secretary) of England, P. Vayssiere and J. Forest of France, and N. R. Stoll and C. W. Sabrosky of U. S. The last was so busy with delegated committee responsibilities that he told me at the end that he did not manage to attend one program session of the subsequent Congress. The gratuitous sacrifice of time and sleep by several interested in accomplishment for the Code cannot be passed over lightly, nor the prodigious work of the secretary in keeping mimeograph information up to the minute in two languages for each succeeding day's deliberations.

Excerpts from a subsequent letter from Secretary Melville are pertinent: ". . . a text of the International Code of Zoological Nomenclature exists, and will certainly be published before the next Congress . . .;" ". . . publication of our Code (after the work of the Editorial Committee has been circulated to the Commission) should be a matter of months rather than years." This is complicated, of course, for the zoological, in contrast to the botanical and bacteriological disciplines, by requirement of exact reproduction in French and English as official languages. In attendance as observers at many sessions also were Drs. R. E. Buchanan, Sec'y of the International Commission on Bact. Nomenclature, and Smith of the Editorial Board of the Botanical Code. Drs. Norman Stoll and Carl Hubbs of the American delegation also presided as alternates at many of the sessions. An odd bit of incidental interest is that I, an entomologist, was elected to the bacteriological committee at the Stockholm microbiological congress in absentia.

The Zoology Congress Program itself was the largest ever attempted and even resulted in 55 "on time" titles and abstracts being "read by title" only, including 7 from USSR and 9 from Jugoslavia and satellites. I was surprised therefore, to find both my papers accepted in 2 different sections. A very wide coverage of zoological interests was included in 12 sections plus sub-sections, and a perusal of the titles indicated that more than half of the daily sessions could supply one or more basic or applied reports with entomological interests. Of course some ecologic, physiologic or genetic studies as well as migrational and zoogeographic patterns made incidental use of insects as subjects or markers in other disciplines to account for some of this bulk. Insects also furnished some role in the Darwin and Wallace Centennial theme of the Congress. There were several nice movies and exhibits involving arthropods.

Among the officers, there was no professional entomologist represented but 3 of the Permanent Committee have utilized arthropods extensively in their studies, namely, J. G. Baer of Switzerland, E. Hindle of London, and E. N. Pavlovsky of Leningrad. The Soviet delegation headed by Professor Pavlovsky was one of the largest represented from any country outside the United Kingdom. He gave one of the 2 addresses at the Final Plenary session of the Congress, and there were 45 other papers by Soviet authors, excluding those read by title, and not including a number of Polish, Czech, Roumanian, and Jugo Slav contributions.

In all, over 600 persons were registered. The meeting facilities and organization of the Congress were excellent. Though ESA was well represented at the prior Colloquium, I could only find 3 of us from U. S. and 2 members from Canada who were on the general program, a much smaller proportion of entomologists than from several other countries. The fact that we have our own international congress which is one of the few ancillary zoological ones, undoubtedly influences our representation at the Congress of Zoology.

There were the customary hospitality sessions, both specialized, and general. The latter included a memorable one in the sacrosanct halls of the British Museum (Natural History) with no apparent stint on champagne, doubtless for the first time within that august institution, and the keepers were some days in renewing the wax on the floors especially in the whale hall. Another one provided some very fine vodka and buffet to a large group of us the last evening at the Russian Embassy with the Soviet delegation as hosts. A fine color picture was shown of the biological inclinations of the Emporer penguin in the Antarctic with sound track in English.

Respectfully submitted,
CORNELIUS B. PHILIP
E.S.A. Delegate

Governing Board Action

The Report was accepted by the Governing Board.

PRELIMINARY STUDY FOR PERMANENT ENTOMOLOGICAL SOCIETY HOME

I. Introduction

At the 1958 Governing Board meeting, President Metcalf was requested to initiate a study of the problems related to securing a permanent home for the Entomological Society of America. By letter from the President of 4 March 1958, the undersigned was asked to accept the assignment. This report is respectfully submitted as a summary of this preliminary study.

II. Background

With the combined administrative and management responsibilities of the two former societies now concentrated into the Office of the Executive Secretary, the past few years have afforded an opportunity to assess more accurately the widely scattered responsibilities and functions previously carried on by the efforts of several key members of the society. In the past few years, the magnitude of duties and increased benefits sought by the membership have rapidly exceeded all possibilities of even the most dedicated, contributed, and voluntary services being able to accommodate the needs of the Society. Thus, the staff and functions of the Executive Secretary have been slowly broadened to meet these necessities. While it is not the purpose of this report to philosophize on the future of the Society, it would appear that future action on a study of

this nature is directly related to the Society's continued growth and effectiveness. Therefore, it seems reasonable to state that the trend of the Society, and in a natural sense the future role of the Science of Entomology, depends largely upon the Society's ability to plan for and to permit the maximum effectiveness of the Office of the Society's Headquarters.

III. *The Present Situation*

The Office of the Executive Secretary and staff is located in the Carnegie Institution at 16th and P Streets North west in Washington, D. C. These quarters have been most generously afforded the Society without charge, and a completely pleasant relationship between the ESA office and the Carnegie Institution officials has been reported from the outset. The Carnegie officials have endeavored to assist the Society on several occasions by making additional storage space available wherever possible and proffering other similar generous actions. The furnishing of these quarters alone has been a very significant contribution to the effective functioning of the Society. The space involved is in an area where comparable office space rents from $5.50 to $6.00 per square foot of floor space per annum. Thus, at a minimum, the Society has been presented the equivalent of a $20,000 gift during the past six years. A fact which could conceivably affect the healthy financial condition of the Society.

The gradual centralization of Society functions, however, has filled the present quarters to the bursting point. (An approximate layout of the present office space was shown to the Board in a drawing.) The Executive Secretary and the Assisting Editor are located in the same small office (190 sq. ft.) to carry out their respective, demanding, and widely varied functions. The secretarial assistance, including the correspondence files, the business records, the publications and mailing equipment are all concentrated in one large room (550 sq. ft.) along with back issue storage, the addressograph and the machines. The resulting difficulties of maintaining effective operations when secretarial duties, business records, and publication preparation must compete with the noise of the addressograph machines under extremely close conditions is too apparent for further comment. It is a tribute to unusual ability and dedication that the Executive Secretary's office has continued such high caliber service to the Society.

The present situation is further complicated by the huge backlog of publications which the Society must maintain. The present storage space cannot accommodate more than ⅓ of the total publications located at several locations, including the JOURNAL published in Wisconsin, and commercial storage facilities. No further storage facilities appear to be available at Carnegie Institution.

Present Society plans call for augmenting a position tentatively designated as a managing editor for its publications. There is no space available for this office to be established other than to place another desk in the office of the Executive Secretary.

Due to the lack of storage facilities, the Carnegie Institution made available publication storage shelves in the halls outside of the entrance to the offices of the Society. While essential to present operations, the general appearance does not lend to the Society's prestige.

Thus summed up, it appears that the Society will be faced with considerable difficulty in continuing operation in the present facilities. There has been no indication that the present space may be required by the Carnegie Institution, but it should be borne in mind that there is no lease and the Society could be asked to vacate on short notice if these facilities should be required.

IV. *Present and Future Requirements*

Any consideration of present or future action must be based on the new requirements of the Society. All persons consulted during this study counseled that any plan should certainly include forseeable future requirements. To limit future flexibility of the Society to the following possible space considerations is *not* the intent of this report. It is more to indicate that many factors should be considered in planning any future home.

The present and immediate future requirements indicate a need for at least 1200 to 1500 sq. ft. of office space and 600 to 800 sq. ft. of publication storage space. It is suggested that the Society consider 1500 to 1800 sq. ft. of office space and 700 to 900 sq. ft. of storage space as a minimum desirable space requirement for a future permanent home. (A possible layout of this space was shown to the Governing Board.)

Other factors considered under future requirements as a result of informal discussions with other members are listed as follows:

a. That Washington, D. C. appears to be the logical location for the Society's permanent home despite its geographical location for the following reasons:
   (1) It is the Center of considerable federal and commercial interest in entomology.
   (2) It is the Center of similar scientific organizations particularly the Biological sciences with whom close cooperation is becoming more and more necessary.
   (3) It is the Center of many federal agencies whose decisions vitally affect the future of entomology.

b. Further, it was considered that the location of the headquarters should be in the close-in area, convenient to all transportation centers for the benefit of members passing through the city.

V. *Future Possibilities*

1. As discussed in Paragraph III, the "status quo" course—remaining in present quarters—even with the sound economic advantage presently enjoyed, does not appear to the undersigned to be in the best interests of the Society. Therefore, it is not included for further discussion other than to say that it does not appear likely that Carnegie Institution can make further space available for the Society's use.

2. A few years ago, an inquiry was made into the possibility of the Society obtaining the Marlatt home as a memorial headquarters for the Society. The Society was advised that a letter would be placed in the estate affairs, by Mrs. Marlatt, suggesting that the Society be given first consideration by the Marlatt family in future estate considerations. However, there is no indication that this will materialize within the next few years, or that other than approximate market value would be considered at such time.

3. The rental or long-term lease of suitable space in the desired area was investigated for approximate rates that could be expected. The Navy Real Estate office was advised that normal desirable office space anywhere in Metropolitan Washington would averate about $5.50 per square foot per year, completely maintained. These are the rates paid by the Government Services Administration and confirmed by various realtors contacted. *Thus, office space under these circumstances would average $9,000 to $12,000 per year* for 1500 to 2000 ft of office space plus $1,000 to $2,000 or more for the required storage space if available.

4. The Society can purchase a building in the previously residential area now being widely utilized for headquarters of several other national scientific and professional organizations. A professional realtor, who was highly recommended for this type of property, was consulted as to this possibility. It was indicated that:

a. The Society could expect to pay between $40,000 and $60,000 for property of this type, suitable for a Society headquarters.

b. From $5,000 to $15,000 additional was usually necessary to adapt these buildings to the Society's needs.

c. About $750 to $1500 janitorial services, plus maintenance cost, could be expected.

d. And, 15 to 20 payments on a $30,000 loan would amount to $225 to $250 monthly, plus insurance and taxes. Taxes, however, were believed to be low for non-profit organizations.

e. *The Society would own its building in about the same time required for a long-term rental lease.*

The realtor indicated that while handling lease property and sale property, he would advise the Society to buy its headquarters for the identical reasons that long-term residents buy, instead of using long-term leases. This opinion was concurred in by two other well established firms.

5. The possibility of jointly using facilities with other similarly oriented organizations is very real, at this time. The American Institute of Biological Sciences is seriously considering, at this time, a 10 year lease arrangement with option to buy later on a warehouse to be adapted to office space in the Georgetown area. The offers involve sufficient floor space to accommodate AIBS and leave at least 3,000 sq. ft. or more available to another organization. This location and possibility has been reviewed by the undersigned with the company of the Executive Secretary. It offers the following advantages:

a. A lease rate of $3.50 to $4.00 per sq. ft. for space built to the needs of the organization.

b. The possibility of combined use of reception, mailing, conference, and other facilities of mutual interest to both societies. *Some considerable savings in* office expenses *might be possible* in this arrangement if mutually agreeable.

c. The option to buy if the arrangement proved desirable as a permanent home after several years' use.

d. A prestige area (not necessarily as convenient as other possibilities, however).

e. Sufficient space for future expansion.

Since this possibility developed very recently, considerable exploration would be necessary to establish several points of intent concerning desirable space allocation, but informal discussions with representatives of AIBS indicate sufficient flexibility in planning to warrant serious further consideration if the Board so indicates.

In brief, this suggested arrangement might offer the Society the opportunity to arrange office and storage somewhat to its own selection and requirements at an approximate cost of around $8,000 to $10,000 per year depending upon space and facilities required for a 10 year lease with an option to buy within the latter part of the lease.

VI. *Summary*

It is the conclusion of the undersigned at this time that further consideration of the possibilities for a future permanent home for the Society could best be directed toward the possibilities suggested in Paragraph V sub-paragraphs 4 and 5. It is suggested that action, if indicated, in combination with the AIBS may be desirable within the next year's time.

The assistance of many individual members and associates is gratefully acknowledged in the preparation of this study. Particular appreciation is expressed for the advice of Dr. Frank Campbell, Dr. Paul Oman, Captain Kenneth L. Knight and for the "open house" assistance of Mr. R. H. Nelson and his staff.

Respectfully submitted,
GEORGE L. HUTTON
E.S.A. Representative

Governing Board Action

The Report was accepted by the Board. The complete study by Mr. Hutton was much appreciated by the Board. Dr. Hiden Cox, Executive Director of AIBS discussed at length the possibility of renting quarters. The final action of the Board is discussed in connection with the minutes of the business meetings of the Society.

REPORT OF REPRESENTATIVE TO THE ANNUAL MEETING OF THE AMERICAN MOSQUITO CONTROL ASSOCIATION

The Executive Secretary was asked to attend the 1958 meeting of the American Mosquito Control Association. A report on this meeting was published on page 67 of the June 1958 BULLETIN.

ENTOMOLOGICAL SOCIETY OF AMERICA

1959

OFFICERS

President.....P. W. Oman
President-Elect.....M. P. Jones
Executive Secretary.....R. H. Nelson

GOVERNING BOARD

P. W. Oman.....Beltsville, Maryland (1960)
J. E. Bussart....Wheaton, Illinois (North Central, 1960)
Roy Hansberry.....Modesto, California (F, 1961)
M. P. Jones.....Washington, D. C. (1961)
K. L. Knight...Camp Lejeune, North Carolina (D, 1959)
E. Gorton Linsley.....Berkeley, California (A, 1960)
E. H. Littooy.....Sausalito, California (Pacific, 1959)
C. M. Meadows.....Waco, Texas (Southwestern, 1961)
R. L. Metcalf.....Riverside, California (1959)
R. H. Nelson.....Washington, D. C. (non-voting)
Morris Rockstein.....New York, N. Y. (B, 1960)
Ralph W. Sherman.....Washington, D. C. (E, 1959)
O. I. Snapp...Fort Valley, Georgia (Cotton States, 1959)
E. A. Steinhaus.....Berkeley, California (C, 1961)
Neely Turner...New Haven, Connecticut (Eastern, 1961)

BRANCH OFFICERS

Branch Chairmen

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R. I. Sailer.....Beltsville, Maryland (Eastern Branch)
R. E. Hill....Lincoln, Nebraska (North Central Branch)
Leslie M. Smith.....Davis, California (Pacific Branch)
Paul Gregg.....College Station, Texas (Southwestern)

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C. W. Wingo....Columbia, Missouri (North Central Branch)
H. H. Keifer.....Sacramento, California (Pacific)
H. E. Meadows.....Houston, Texas (Southwestern)

EDITORIAL BOARDS

Annals of the Entomological Society of America

Frank N. Young, Bloomington, Indiana.....(A, 1963)
J. J. Pratt, Jr., Wayland, Massachusetts.....(B, 1962)
J. A. Adams, Poughkeepsie, New York.....(C, 1961)
L. E. Rozeboom, Baltimore, Maryland.....(D, 1960)
M. H. Hatch, *Chairman*, Seattle, Washington.....(A, 1959)

Journal of Economic Entomology

Ruth L. Busbey, Berwyn, Maryland.....(F, 1963)
G. J. Haeussler, Beltsville, Maryland.....(C, 1962)
D. E. Howell, Stillwater, Oklahoma.....(D, 1961)
R. L. Metcalf, Riverside, California.....(B, 1960)
E. L. Chambers, *Chairman*, Madison, Wisconsin.....(E, 1959)

Entoma

R. W. Harper, Sacramento, California.....(E, 1963)
R. W. Roth, Glenview, Illinois.....(F, 1962)
W. C. McDuffie, Beltsville, Maryland.....(D, 1961)
J. W. Apple, Madison, Wisconsin.....(F, 1960)
M. P. Jones, *Chairman*, Washington, D. C.....(E, 1959)

Miscellaneous Publications of the Entomological Society of America

R. I. Sailer, Beltsville, Maryland.....(A, 1963)
Neely Turner, New Haven, Connecticut.....(B, 1962)
Ray F. Smith, Berkeley, California.....(C, 1961)
K. L. Knight, Camp Lejeune, North Carolina.....(D, 1960)
B. B. Pepper, *Chairman*, New Brunswick, New Jersey.....(F, 1959)

Thomas Say Foundation

M. T. James, Pullman, Washington.....(A, 1963)
Herbert T. Dalmat, Bethesda, Maryland.....(D, 1962)
L. E. Chadwick, Urbana, Illinois.....(B, 1961)
H. O. Deay, Lafayette, Ind.....(C, 1960)
C. W. Sabrosky, *Chairman*, Washington, D. C.....(A, 1959)

STANDING COMMITTEES

Committee on Common Names of Insects

H. E. Evans, Ithaca, New York.....(1961)
F. D. Miner, Fayetteville, Arkansas.....(1961)
Vacancy.....(1961)
L. C. Kuitert, Gainesville, Florida.....(1960)
L. O. Warren, Fayetteville, Ark.....(1960)
F. P. Keen, Lafayette, Calif.....(1959)
A. V. Mitchener, Ottawa, Ontario.....(1959)
R. I. Sailer, Beltsville, Maryland.....(1959)
J. L. Laffoon, *Chairman*, Ames, Iowa.....(1960)

Committee on Entomological Nomenclature

C. W. Sabrosky, Washington, D. C.....(1961)
G. P. Holland, Ottawa, Ontario.....(1961)
D. E. Hardy, Honolulu, Hawaii.....(1960)
R. M. Bohart, Davis, California.....(1960)
C. B. Philip, Hamilton, Montana.....(1960)
J. L. Laffoon, Ames, Iowa.....(1959)
H. K. Townes, Ann Arbor, Michigan.....(1959)
J. A. Slater, Storrs, Connecticut.....(1959)
R. L. Usinger, *Chairman*, Berkeley, California.....(1961)

Committee on Finance

J. V. Osmun, Lafayette, Indiana.....(1961)
S. E. Jones, West Hyattsville, Maryland.....(1960)
J. E. Bussart, *Chairman*, Wheaton, Illinois.....(1959)

Committee on Insect Surveys

E. W. Beck, Tifton, Georgia.....(1962)
O. H. Hammer, Midland, Michigan.....(1962)
J. N. Roney, Phoenix, Arizona.....(1961)
R. L. Furniss, Portland, Oregon.....(1961)
N. O. Berry, Sacramento, California.....(1960)
L. D. Newsom, Baton Rouge, Louisiana.....(1960)
K. D. Quarterman, Savannah, Georgia.....(1959)
C. A. Bower, *Chairman*, Oklahoma City, Oklahoma.....(1959)
Kelvin Dorward, *Ex Officio*, Vienna, Virginia
P. W. Oman, *Ex Officio*, Beltsville, Maryland

Committee on Insecticide Reference Standards

Rosmarie von Rümker, Kansas City, Missouri.....(1962)
L. H. Dawsey, Tifton, Georgia.....(1961)
J. E. Casida, Madison, Wisconsin.....(1960)
G. F. Ludvik, *Chairman*, St. Louis, Missouri.....(1959)

Committee on Insecticide Terminology

R. B. March, Riverside, California.....(1961)
S. A. Hall, Beltsville, Maryland.....(1960)
B. N. Smallman, Ottawa, Ontario.....(1960)
T. G. Bowery, Raleigh, North Carolina.....(1959)
Wm. M. Hoskins, Berkeley, California.....(1959)
Carroll N. Smith, *Chairman*, Orlando, Florida.....(1961)

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J. M. Grayson, Blacksburg, Virginia.....(1961)
A. C. Gunter, Dallas, Texas.....(1961)
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L. A. Carruth, Tucson, Arizona.....(1959)
W. G. Eden, *Chairman*, Auburn, Alabama.....(1959)

Committee on Professional Training, Standards and Status

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R. E. Heal, Elizabeth, New Jersey.....(1961)
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C. E. Palm, Ithaca, New York.....(1959)
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Program Committee

R. W. Sherman, Washington, D. C.....(1961)
L. D. Anderson, Riverside, California.....(1959)
E. H. Smith, *Chairman*, Geneva, New York.....(1960)

SOCIETY REPRESENTATIVES

Representative on the Governing Board of the American Institute of Biological Sciences

F. W. Poos, Washington, D. C.....1962

Representative on National Cattle Grub Commmittee

E. F. Knipling, Beltsville, Maryland.....1959

Representative on the AAAS-Campbell Award Committee for Vegetable Research

G. J. Haeussler, Beltsville, Maryland.....1959

Representative to the American Grasslands Council

B. A. App, Beltsville, Maryland.....1959

Representative to the National Research Council, Division of Biology and Agriculture

A. B. Gurney, Washington, D. C.....1959

Representative to the Agricultural Research Institute, Agricultural Board

H. H. Shepard, Washington, D. C.....1959

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Sub-Section c, Insect Vectors of Plant Diseases

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F. Chemical Control Investigations

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R. J. Norton, *Vice-Chairman*, Durham, New Hampshire
M. M. Barnes, *Secretary*, Riverside, California

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T. B. Davich, Bryan, Texas
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PROCEEDINGS OF THE FORTY-SECOND ANNUAL MEETING OF THE PACIFIC BRANCH, ENTOMOLOGICAL SOCIETY OF AMERICA

San Diego, California, June 25, 26, 27, 1958

Chairman Laurence S. Jones opened the forty-second annual meeting in the Caribbean Room of the El Cortez Hotel at 9:00 a. m. Dean F. Palmer, San Diego Agricultural Commissioner welcomed the Branch to San Diego. Palmer gave a brief resume of agricultural history in San Deigo County, mentioned some of the local tourist attractions, and told some humorous stories.

Chairman Jones responded.

R. L. Metcalf, President of the Entomological Society of America, discussed the Urgent Need for more Precision in Insect Control. He pointed out the great variety of insecticides available for study and said that there should be increased effort to learn how to use them properly. One problem has been wholesale destruction of parasites, with detrimental results, and he stressed the need for research on systemics to overcome this. Other problems needing urgent attention are reduction of residues, more timely applications of treatments, and better public relations.

Chairman Jones then called the preliminary business session to order. The Secretary-treasurer read the financial report for the 1957–58 fiscal year and presented it to the Auditing Committee.

E. H. Littooy, Branch Representative to the Governing Board of the Society described the long hours put in by the Governing Board on Society affairs. He discussed the ballot recently received by Society members which had three propositions: 1. Should Society dues be raised $3.00 a year; 2. Should the Society affiliate with the American Institute of Biological Sciences; 3. Should each Society member pay $1.00 for refunding to the respective Branch

of membership. Mr. Littooy stressed the desirability of voting for the $3.00 increase in dues and for joining the American Institute of Biological Sciences.

The next item of business was the reconsideration of Article II of the Branch constitution which defines the area assigned to the Branch by the Society, and therefore the membership. This article was tabled at the Portland meeting in 1957 as being incomplete at the time. The Secretary read the revised article, it now being satisfactory to the Society.

Article II. Membership

Section 1. All members of the Entomological Society of America residing in Alaska, Saskatchewan, Alberta, British Columbia, Washington, Oregon, Idaho, Montana, Wyoming, Utah, Nevada, California, Arizona, Sinaloa, Sonora, Baja California, and in the mid-Pacific Islands including Hawaii, Guam and Samoa, are members of the Pacific Branch.

Since the Branch *Executive Committee* had approved the revised article, it required one reading and a ⅔ vote for adoption. R. E. Campbell moved we remove the article from the table and adopt it. The motion was seconded and passed with no dissenting votes.

As there was no further business, Chairman Jones adjourned the preliminary business meeting preparatory to the start of the paper-reading sessions.

The Branch program contained 64 submitted papers, 5 invitational papers and 5 symposia. The invitational papers were:

1. The Impact of Accelerated Research Programs in Physical Science upon Research in Biological Sciences, A. M. Boyce, Citrus Experiment Station, Riverside.
2. Recent Advances in Insect Pathology, Yoshmori Tanada, University of California, Berkeley.
3. The Nature and Use of Insect Attractants and Repellents, E. F. Knipling, Entomology Research Branch, U. S. Department of Agriculture, Beltsville, Maryland.
4. Changes in Entomological Collecting Technique Over the Past One Hundred Years, Calvert E. Norland, Department of Zoology, San Diego State College.
5. The Cytogenetic Basis of Speciation in Chilocorus, S. G. Smith, Entomology Laboratory, Belleville, Ontario, Canada.

The symposia were as follows:

1. Problems of Area-wide Chemical Control—
   Moderator—James A. Beal, Forest Service, USDA
   Aspects of Forest Spraying—Clarence H. Hoffmann
   Integrated Chemical and Biological Control of Agricultural Pests—R. van den Bosch
   The Place of Chemicals in Vector Control—Richard F. Peters
   Chemical Industry Viewpoint, Public Relationships, Legal Problems—Lea S. Hitchner.

This series of talks emphasized the need for more fundamental research in the ecology of the plants and animals in areas treated by broadcast chemicals. Effects on the thinking of people in areas subjected to widespread control operations were noted, especially a case involving gypsy moth control where local residents brought suit to halt operations. It is necessary to balance some loss of valued things against the benefits gained. Many conversationists and protectors of wild life exaggerate the damage done by widespread control. But there does need to be improvement of public relations.

2. Evaluation of Biological Control
   Moderator—Kenneth S. Hagen
   Methods of Evaluating Effectiveness of Biological Control—James K. Holloway
   Evaluation of Biological Control of Forest Insects by Sampling Natural Populations—R. E. Balch
   The Influence of Temperature on Discrete Phases of Host-parasite Interaction—Thomas Burnett
   Determination of Critical Density Indices for Natural Enemy and Host Pest Populations in Integrated Control Programs—Kenneth S. Hagen
3. Recent Advances in the Use of Systemics for Control of Agricultural, Nursery, and Livestock Pests
   Moderator—Gaines W. Eddy
   Use of Systemics for Control of Agricultural Pests—H. T. Reynolds
   Use of Systemics for Control of Nursery Pests—Charles F. Doucette
   Use of Systemics for Control of Livestock Pests—A. W. Lindquist

The symposium, under the able moderation of Dr. Gaines W. Eddy, was well received by a large attendance. Dr. H. T. Reynolds, in a discussion of the agricultural aspects, touched briefly upon metabolic fate of the compounds within the plant, residue problems, and the potential value of the various methods of application. Recent research with the newer systemics, particularly Thimet and Di-Syston, were discussed with emphasis upon soil and seed treatment. Mr. Charles F. Doucette reviewed progress with systemics on nursery crops, and spent considerable time in discussing use, present and potential, for bulb treatment. Dr. A. W. Lindquist discussed progress with use of livestock systemics, particularly for cattle grub control, but also for screw worms, hornflies, and other animal pests. The most promising materials to date for use on animals are ET–57 (Trolene) and Co-Ral.

4. Biological Criteria in Insect Classification—
   Moderator—I. M. Newell
   The Bearing of Biological Criteria on the Species Formation Problem—W. P. Stephen
   Biological Unites in the Nomenclature of Parasitic Hymenoptera—S. E. Flanders
   Biological Considerations in the Classification of the Scolytidae—A. D. Moore
   Adaptive Significance of the Structural Characters in the Classification of Adult Cerambycidae—E. G. Linsley
   Biological Characteristics in the Classification of Mites—I. M. Newell

The importance of biological criteria in insect classification was well illustrated by examples from the Trichoptera, Coleoptera, Hymenoptera, Diptera, and Acari. It was pointed out that in some cases such non-morphological features as gallery type (Coleoptera, Scolytidae) and host adaptations (parasitic Hymenoptera and mites) were more reliable and easier to apply than morphological distinctions in recognizing the existence of species or in differentiating between them. The adaptive significance of color patterns, mimicry, and structural features in the Cerambycidae was described in detail. Two of the more important considerations that must be kept in mind in utilizing biological characteristics are (1) that biological and morphological characteristics are not rigidly separable but blend one into the other, and (2) that such biological characteristics as larval habits and morphology must be used with extreme care since evolution can proceed along quite different lines in various stages of the development of holometabolous insects or mites.

5. Current Pest Eradication and Suppression Programs in Regulatory Entomology in the Western United States
   Moderator—Robert W. Harper
   Contributions to, participation in, and viewpoints regarding these activities at the County Level—Robert M. Howie

For the State	—	Robert W. Harper
For the Federal Government	—	James R. Dutton
For Universities	—	George F. Knowlton
For Industry	—	Harold C. Lewis

Regulatory programs in Entomology are in part the first line of defense against agricultural pests. The quarantine organizations, both on state borders and within counties, seek to halt pest entry. County organizations, such as the County Agricultural Commissioners in California, maintain contact and familiarity with local conditions. At the State level, detection surveys and suppression programs are coordinated with County and Federal activities. The Federal Government has no local pest eradication programs, leaving those to local agencies. In Mexico, the U. S. Department of Agriculture has study and eradication projects on citrus blackfly, pink bollworm, Mexican fruit fly. Universities conduct research in control methods and train future workers. The Industry is vitally interested in these prevention and suppression programs and contributes by aiding in the securing of operating funds and improving public relations.

The Third Annual Photo Salon was held in the Caribbean Room, 8:00 p.m. on June 25. L. R. Brown and J. C. Chamberlin were co-chairmen. Judges were A. M. Boyce, R. N. Jefferson, and B. E. White.

The Salon was well attended by an appreciative audience.

The Pacific Branch *Executive Committee* met on the evening of June 24. There were discussions dealing with various matters concerning the welfare and policies of the Branch. Specific actions of general interest were:

1. It is necessary for the Branch secretary to meet a number of expenses during the year, such as incidental postage, long distance telephone calls, and travel expense. To enable the secretary to meet these promptly without disturbing the general balance of the Branch treasury, R. E. Campbell moved that the Secretary withdraw sufficient money to maintain his own fund. L. E. Gentner seconded; the motion passed.
2. The Pacific Branch Constitution lacks sufficient directives for the conduct of its business, so E. H. Littooy moved that the next Branch Chairman (L. M. Smith) appoint a committee to draw up by-laws for the Branch constitution and report to the 1959 *Executive Committee*. H. C. Manis seconded; the motion passed.

Chairman L. S. Jones called the annual business meeting to order at 1:30 p. m., Friday, June 27. The first order of business was committee reports.

R. W. Harper, Chairman of the *Auditing Committee*, reported the financial accounts of the Branch were in proper order:

Financial Report

	In	Out	Balance
Old balance, June 20, 1957			**$689.43**
Income from 237 registrations at Portland, June 1957	$711.00		1,400.43
Check #7, unclaimed	32.28		
Total 1957–1958 expenses		$410.39	
New balance, June 20, 1958			**$1,022.32**
Disposition of cash			
On deposit, see June 1958 bank statement			**$1,059.56**
Uncleared checks			
Check #32	$15.00		1,044.56
Check #33	17.00		1,027.56
Check #4	5.24		1,022.32

NOTE: The printer's bill for the programs and miscellaneous charges, which came in too late for entry, is $489.68. This leaves a balance of $532.64.

The Secretary read a report of membership progress in the Branch:

Report of 1957–1958—Membership Committee

MEMBERS RECEIVED		
New members	75	
Transfers into Branch	7	
Reinstatements	3	
		85
MEMBERS REMOVED		
Transfers out of Branch		
Regular members	15	
New members	1	
Resignations	10	
Deaths	7	
		33
Total membership residing in the Branch Area as of June 20, 1958		1,113

Glenn E. Carman, Chairman of the Resolutions Committee, presented the following resolutions:

Resolution I

WHEREAS the business meetings of the Pacific Branch should be conducted on well established parliamentary principles

AND WHEREAS Robert's Rules of Order sets forth these principles in a clear and concise manner

BE IT RESOLVED that the Pacific Branch adopt the book, Robert's Rules of Order, for the conduct of its business meetings, with the Branch Constitution taking precedence in case of conflict.

The Resolutions Chairman moved this Resolution be adopted to place Branch business meetings on an orderly parliamentary basis. Motion seconded and carried.

Resolution II

WHEREAS the Branch has lost by death eight of its faithful and esteemed associates, namely:

1. Dwight F. Barnes
2. R. A. Cushman
3. Gordon Floyd Ferris
4. Morris Katzman
5. Walter C. Noon
6. Al Skow
7. Harry S. Smith
8. Mathis C. Tanner

THEREFORE, BE IT RESOLVED that the Secretary be instructed to write letters of condolence to their families.

The Resolutions Chairman moved this resolution be adopted. Motion seconded; carried.

Resolution III

WHEREAS the members of the Pacific Branch of the Entomological Society of America, their families and friends in attendance at this 42nd Annual Meeting have enjoyed an outstandingly instructive program and have participated profitably in all phases of the meeting.

BE IT RESOLVED that the membership hereby express their appreciation to the Branch officers, the operational committees and all others who contributed so effectively to the organization and presentation of this meeting and

AND BE IT FURTHER RESOLVED that the Secretary be instructed to express in writing the appreciation of the membership to the management of the El Cortez Hotel for the use of its splendid facilities and its cooperative efforts in making their meetings functionally successful.

The Resolutions Chairman moved this resolution be adopted. Motion seconded; carried.

Resolution IV

WHEREAS, the misuse of pesticides discredits sound pest control practices and obviously reflects against the entomological profession.

BE IT RESOLVED that the Pacific Branch condemn unsound and unproven pest control practices and

AND BE IT FURTHER RESOLVED that the Branch hereby solicit the cooperation of all other agencies involved in pest control activities in eliminating the use of unsound practices.

The Resolutions Chairman moved this resolution be adopted. Motion seconded; carried.

Resolution V

WHEREAS, the restrictions placed on the collecting of insects and other arthropods in state parks, national parks and national monuments work to the detriment of serious entomological studies in such areas

BE IT RESOLVED that the Entomological Society of America, Pacific Branch, undertake the study of this problem with the objective of formulating recommendations to the appropriate officials.

The Resolutions Chairman moved that this resolution be adopted. There followed some discussion as to how best to handle this resolution since it is national in scope. Specifically, much of the desert area back of San Diego is closed, placing a severe handicap on Southern California insect collectors.

H. M. Armitage moved that the resolution be amended to refer it to the parent Society. The amendment was seconded and carried.

The resolution, which had already been seconded, was then passed with no dissenting votes.

J. B. Steinweden, Chairman of the *Pest Control Legislation Study Committee*, read the committee's report:

> This committee was appointed as a direct result of a motion which was passed at the final business session of the Pacific Branch in Portland last year. This motion was as follows:
>
> "That the Pacific Branch Chairman appoint a committee to study pest control laws in force in the various states encompassed by the Branch with specific reference to California, and make recommendations as to improving these laws."
>
> The committee has studied the pest control laws and regulations of these states and has compiled a file of these laws and regulations. Two committee meetings were held; one on June 24, 1958, at which five committee members and R. Z. Rollins, Chief, Bureau of Chemistry, California Department of Agriculture, were present; and a second meeting on June 26 with seven committee members present.
>
> It was learned that seven western states have laws and regulations pertaining to agricultural pest control. These states are: California, Arizona, Nevada, Utah, Washington, Oregon, and Idaho.
>
> California has a structural pest control law and some cities in Arizona, including Phoenix and Tucson, have city ordinances covering structural pest control work.
>
> The committee also studied two papers written by one of the committee members, G. F. Carter, on the following subjects:
>
> 1. Methods of Encouraging Professional Entomologists in Commercial Pest Control.
> 2. Discussion of Constitutionality of the California Code in Reference to the Pest Control Business.
>
> We believe that the Pacific Branch should encourage a thorough study in order to protect and to advance our entomologists so that the standards of applied entomology will continue to be raised and the talents of entomologists be so utilized that they may best serve the public interests.
>
> The tremendous developments in pest control have placed greater responsibilities on the professional entomologist and the committee realizes that this responsibility must be recognized by adequate legal control. The committee believes that entomologists themselves should have an active role in improving and raising their own professional standards.
>
> It is proposed that the chairman of the Pacific Branch be authorized to make available a committee to consult with other organizations on proposed legislation at their request.
>
> However, this committee does not feel that there is any other action that the Branch should take at this time.
>
> Respectfully submitted,
> HARVEY BALES
> G. F. CARTER
> A. F. KIRKPATRICK
> W. T. MENDENHALL
> A. E. MICHELBACHER
> GEORGE T. POPPIC
> WILLIAM M. UPHOLT
> JOHN B. STEINWEDEN, *Chairman*

After finishing the report, Mr. Steinweden read his own statement as a minority report:

> The chairman of the committee would like to report that he cannot agree with the next to last paragraph of the committee report, because he believes that the Pacific Branch should not become involved in legislation. He believes that any changes in present laws is a matter for the pest control operators, the chemical industry, and related industries to handle.

Upon the completion of the report and remarks by the Committee Chairman C. O. Barnard moved the report be tabled. The motion to table was seconded and passed with few dissenting votes.

A. J. Flebut, chairman of the *Nominating Committee*, placed Hubert C. Manis of the Department of Entomology, University of Idaho, Moscow, in nomination for *Chairman-elect* of the Branch. R. E. Campbell moved the report be accepted, which motion was seconded and passed. H. M. Armitage moved the Secretary cast a unanimous ballot for the candidate; A. F. Swain seconded, and the motion passed.

Chairman L. S. Jones then called for nominations of candidates for Active Member of the *Executive Committee*. Two new members were to be elected for 3-year terms. Kenneth Kessler nominated A. E. Michelbacher; Cyril Gammon nominated R. W. Harper; R. M. Howie nominated Ralph March; Glenn E. Carman nominated Harold Lewis. Chairman Jones appointed an election committee of D. W. Robinson, C. H. Wallis, and Cyril Gammon, who distributed ballots and counted votes. The result of the vote was the election of Harold Lewis and A. E. Michelbacher to the positions as Active Members of the Branch *Executive Committee*, with terms expiring at the end of the annual business meeting in June 1961.

NOTE: The election of H. C. Manis, who had served one year as an Active Member of the *Executive Committee*, to Chairman-elect, left a vacancy which Chairman L. M. Smith has filled, according to constitutional provision, by appointing Ralph March to serve the remainder of the term, ending with the annual business meeting June 1960.

Branch Chairman L. S. Jones then extended his thanks to the members of the various committees and to others who had cooperated in making his term and the San Diego meetings successful. He then turned the gavel over to L. M. Smith, University of California at Davis, who assumed office as Branch Chairman. The new Chairman announced

that the 1959 meeting of the Pacific Branch would be at the El Dorado Hotel, North Sacramento, California. Smith then introduced Chairman-elect H. C. Manis, and adjourned the annual business meeting preparatory to the final paper reading session of the program.

There was a total of 326 registrants: 286 Society members, 35 non-members, and 5 complimentary.

Respectfully submitted,

H. H. KEIFER, *Secretary-Treasurer*

1958 GOVERNING BOARD

ENTOMOLOGICAL SOCIETY OF AMERICA, SALT LAKE CITY, UTAH, DECEMBER 3, 1958

Standing, left to right. Roy Hansberry (Section F, new), B. B. Pepper (Eastern Branch, retiring), Fred W. Fletcher (Section F, retiring), E. G. Linsley (Section A), Morris Rockstein (Section B), J. E. Bussart (North Central Branch), Neely Turner (Eastern Branch, new), C. M. Meadows (Southwestern Branch), E. A. Steinhaus (Section C, new).

Seated, left to right. R. H. Nelson (Executive Secretary), H. M. Armitage (Past President), M. P. Jones (Section E, retiring), R. L. Metcalf (President), P. W. Oman (President-Elect), C. P. Clausen (Section C, retiring), E. H. Littooy (Pacific Branch). Busy elsewhere when the picture was taken, O. I. Snapp (Cotton States Branch) and R. W. Sherman (Section E, new). K. L. Knight (Section D), was absent.

GEORGIA ENTOMOLOGICAL SOCIETY

The rules regarding affiliation of local societies with the Entomological Society of America were published on page 5 of the March 1955 issue of the BULLETIN and again on the inside front cover of the December 1956 issue.

The Georgia Entomological Society, an affiliate of the former American Association of Economic Entomologists, has met all requirements for affiliation with the present Society and their application was approved by the Governing Board at Salt Lake City. We take this means of extending our best in the way of welcome.

The 1958 meeting of this Society was held at St. Simons Island on February 5–7. The Entomological Society of America Executive Secretary attended that meeting and found it most enjoyable and profitable. The 1958 officers elected there were

President	—	HAMILTON LAUDANI
Vice President	—	J. M. MAXWELL
Secretary	—	H. H. TIPPINS
Historian	—	O. I. SNAPP

The 1959 meeting was held at Radium Springs, Georgia, on March 4 and 5. We hope to have a short report on this meeting in the June BULLETIN.

OHIO STATE UNIVERSITY HONORS

Professors Alvah Peterson and Wenceł J. Kostir of the Department of Zoology and Entomology at The Ohio State University were honored by department staff members and friends at a banquet and reception at the Faculty Club on the evening of January 6. Both men have recently retired to the rank of Professor Emeritus. Professor Peterson was a staff member for 30 years and Professor Kostir's career at the University extended over 44 years.

Eighty-seven guests attended the dinner. Reviews of the men's professional careers were given by Dr. Carl Venard and by Dr. Joe N. Miller. Dean C. S. Hutchison of the College of Agriculture represented the administration and presented the University's appreciation for their long years of service.

Professor Kostir was a student under Dr. Herbert Osborn and his early studies were on the Orthoptera, but for many years he had specialized on the Protozoa. Dr. Peterson's studies on insects are familiar to all entomologists and he is continuing an active career in entomology in the Entomology Department, State Plant Board, Gainesville, Florida.

THE MINIMUM PROPERTY STANDARDS FOR ONE AND TWO LIVING UNITS

Federal Housing Administration No. 300, November 1, 1958, pp. 315, 4 figs. (maps), 93 diagrams 10—4 tables

Chap. VIII—*Construction.* Section 815, pages 113–119. Protection against termites and decay. Standards apply to subterranean termite and decay control measures. Where drywood or dampwood termites present hazard additional precautions may be required by local FHA field office.

Measures predicated on important construction practices:

Adequate drainage for site and building.
Minimum clearances between ground and wood.
Adequate ventilation of structural spaces.
Proper flashing.
Installation of vapor barriers and sheathing paper when required.

Acceptable termite protection serves as physical or chemical barrier—essential that free inspection of structural wood parts in substructure be made periodically. Notice shall be posted in dwelling by builder that termite protection (naming method) has been provided and that semi-annual inspection should be made to detect the presence of termites.

Attached garages, carports, porches and any accessory buildings shall be provided with same protective measures.

Termite protection:

Provide termite protection in all areas where infestation is very heavy; where moderate to heavy, provide protection in areas required by FHA field office; where slight to moderate, protection is not required except where determined by FHA field office that hazard exists; where none to slight, protection is not required.

All stumps, roots, fallen timber and other wood or wood product debris shall be removed from building site before completion.

Concrete porch floors, entrance platforms, planters, fences, screens, or other appurtenances shall be separated from the main structure or be protected against termites.

Termite protection where required shall be:

Concrete foundations
Metal shields
Reinforced concrete foundation caps
Soil treatment
Treated lumber

Soil treatment:

Aldrin 0.5% oil or water emulsion.
Benzene hexachloride 0.8% do.
Chlordane 1.% do.
Dieldrin 0.5% do.
DDT 8% in oil.
Lindane 0.8% oil or water emulsion.
Trichlorobenzene 1 part to 3 parts oil.
Other materials if acceptable by FHA; if they meet 5 year test by U. S. Forest Service; if they contain one or more of above chemicals in concentrations recommended; must have no toxic effects to humans, to beneficial plant or animal life. Same dosages as in the BRAB report.
Guarantee shall be furnished owner by builder, copy to FHA field office, that application complies with standards and that it will be effective for 5 years. Reinfestation within period will be retreated at no cost to owner.

Treated lumber shall be pressure-treated in accordance with Federal Specifications TT-W-571 d, shall be identified by name of the treater, preservative used, and retention in pounds per cu. ft.

Decay protection:

Provide protection where required by FHA field office. Certain members are required to be protected in all areas. Requirement for other members based upon location in respect to moisture conditions such as annual precipitation, relative humidity and temperatures during periods of high humidity. Fig. 3 showing relative decay hazard by regions may be used as a guide.

Methods are same as for termite protection. Doors, windows and other exterior woodwork shall be treated in accordance with the Nat'l. Woodwork Manufacturers Association.

Or California redwood—"foundation grade"—for sills and plates, "all heartwood"—for other uses.

Tidewater red cypress—"100% heartwood" for sills and plates, "85% girth measure" for other uses.

Western red cedar—"100% heartwood."

Material shall be grade marked and stamp of the lumber association or inspection agency.

Protection required in all areas:

Sleepers embedded in or on concrete slabs-on-ground.
Exterior door frames and indoor sash and frames.
Access panels, doors and frames to basementless spaces.
Treatment shall be paintable type.
Fence posts.

In general, these MPS follow the recommendations of the two BRAB reports.[1] Important departures are:

Soil treatment: A retreatment guarantee is to be provided by the builder, not by the soil treater, there is no replacement guarantee, with proper financial backing required. Aldrin has been added, sodium arsenite omitted.

A lesser amount of pressure-treated lumber is recognized as adequate protection.

Shields are recognized as an alternate protective measure in concrete slab construction. No branding or guarantee is required by the manufacturer or the installer.

Abstracted by
THOS. E. SNYDER

KARL P. SCHMIDT FUND

The Karl P. Schmidt Fund has modest sums available to assist persons wishing to study at the Chicago Natural History Museum. Grants will be made for study in any of the four fields encompassed by the museum: anthropology (with a natural history orientation), botany, geology (including paleontology), and zoology. An applicant should describe the study proposed in brief terms, state the length of time he wishes to study at the museum and the amount of money needed, and name one reference.

Applications should be mailed to: Chairman, The Karl P. Schmidt Fund, c/o Chicago Natural History Museum, Roosevelt Road and Lake Shore Drive, Chicago 5, Illinois.

MONSANTO EXPANSION

[Monsanto Chemical Company has geared itself for a possible 75 per cent future expansion of its research effort on new chemicals for farming with its new Agricultural Research Laboratory now in operation at the company's headquarters site in suburban St. Louis.

The new facility, a sprawling two-story structure of porcelainized steel, plastic and glass, provides more than 25,000 square feet of floor space for its research staff; includes laboratories, offices, conference rooms, a research library and eight adjoining greenhouses.

In its laboratories and greenhouses, scientists carry out rigidly controlled tests of the effectiveness of new chemicals as possible insecticides, weed-killers and agents for the control of plant diseases. In addition to chemists, the scientific staff includes biochemists, entomologists, plant physiologists and pathologists, microbiologists and agronomists.

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[1] Dillon, R. M., ed. 1956. A study of protection against decay and termites in residential construction. Building Research Advisory Board for Federal Housing Administration: Nat'l. Acad. Scis.—Nat'l. Res. Council Divis. Engineering and Industr. Res., pp. 60, 2 figs. No. 448. May 10.
Dillon, R. M., ed. 1958. Addendum A., pp. 33, 1 fig. Feb. 11.

MEMBERS IN THE NEWS

A. C. MILLER broke his heel last summer. He has now achieved freedom from cast, crutches, and cane—in that order. We are very pleased to note his return to active circulation.

R. H. CARTER retired from the U. S. Department of Agriculture on February 28, 1959. "Nick" had more than 40 years of service during which he made an enviable reputation in his chosen field of chemistry.

The U. S. Department of Agriculture issues a publication at irregular intervals called Picture Story. E.S.A. members whose pictures have appeared in recent months are S. A. HALL, MORTON BEROZA, MARTIN JACOBSON, NATHAN GREEN, B. H. ALEXANDER, W. E. WESTLAKE, P. G. PIQUETT, OTELIA BODENSTEIN, MILTON S. SCHECHTER, E. L. GOODEN, R. A. FULTON, and THOMAS HENNEBERRY.

CHARLES H. STARKER is now Sales Promotion Director for the Gandy Company, formerly the E. S. Ganrud Company of Owatonna, Minnesota.

CHARLES A. WEIGEL an Emeritus member of the Society, keeps his entomology active with black fly control in the Washington suburban area of Maryland.

S. B. FRACKER retired from the U. S. Department of Agriculture on December 31, 1958. He joined the former Entomological Society of America in 1911 and became a Fellow in 1934. All good wishes!

KENNETH A. HAINES has been appointed to the position formerly held by Dr. Fracker, as Assistant to the Agricultural Research Administrator on Interdepartmental and International Relations.

RODGER C. SMITH who retired from Kansas State College after more than 38 years of service on July 1, 1958, received the Retiring Officer's Award of Gamma Sigma Delta on December 9, 1958.

DONALD D. SHALLOW has returned to his home in Walla Walla, Washington after five years of service with the Mutual Security Program, International Cooperative Administration.

FRANK L. CAMPBELL was installed as President of the Washington Academy of Sciences on January 15, 1959.

JAMES A. NELSON, Publisher of *Pest Control Magazine* has established a Pest Control Magazine Scholarship at Purdue University to encourage young men to attain university training in structural pest control.

VINCENT G. DETHIER, has been named professor of biology at the University of Pennsylvania.

LLOYD E. ROZEBOOM, has been named professor of medical entomology at the Johns Hopkins University School of Hygiene and Public Health.

1958 PESTICIDE CARRYOVER

The U. S. Department of Agriculture today reported that carryover stocks of pesticides on Sept. 30, 1958, averaged about 10 percent lower than on the same date in 1957.

The Department's report is based on an annual survey, still about 20 percent incomplete, conducted in cooperation with the National Agricultural Chemicals Association.

Larger carryovers of newer materials than in 1957, especially organic phosphates and weed killers, were more than offset by shorter inventories of DDT and grain and soil fumigants. Stocks of copper fungicides and 2,4-D weed killers were up, but 2,4,5-T holdings changed little. Primary stocks of chlorinated hydrocarbon insecticides averaged about the same as in 1957, but individual items in the group varied from 40 percent below the average to 100 percent above.

Primary stocks in possession of manufacturers are largely undiluted chemicals but include some formulated concentrates such as grain fumigants and 2,4-D esters.

SUMMER LABORATORY COURSE AT CORNELL

Cornell University announces the annual "Summer Laboratory Course in Techniques and Applications of the Electron Microscope," which will meet this year from June 15th to July 3rd.

The course is planned to meet the needs of senior research workers in the field of electron microscopy. The registration is limited to a small group, to provide ample facilities for the members to pursue extensive laboratory work in their special fields, at introductory or advanced levels depending on their previous experience. The course will include special lectures by authorities in the various fields of application. It is designed to give members an intensive survey of basic theory, as well as interpretation of results and application to research problems.

Requests for information and applications should be addressed to Professor Benjamin M. Siegel, Rockefeller Hall, Cornell University, Ithaca, N. Y.

NECROLOGY

BRYANT, OWEN. 76. Coleopterist. At his home in Montara, California, October 26, 1958.

GERHARD, WM. J. 85. Curator-emeritus Chicago Natural History Museum. Charter member. Fellow in the former E.S.A. In a Chicago railroad station, December 13, 1958.

MATHESON, ROBERT. 76. Retired professor of medical entomology, Cornell University. Charter member. Emeritus Member. Fellow in the former E.S.A. In a hospital at Princeton, New Jersey, December 14, 1958.

SMITH, H. D. 64. Biological control specialist. In Mexico City, January 21, 1959.

ROCKY MOUNTAIN CONFERENCE OF ENTOMOLOGISTS

The twenty-ninth meeting of the Rocky Mountain Conference of Entomologists was held at Cameron Pass 4-H Camp near Gould, Colorado on August 10–14, 1958. There were 175 registered at the meeting. Of these 65 were entomologists and the remainder were friends and relatives who came along to enjoy a few days in the mountains. A total of 22 states and one foreign country were represented.

As is traditional with these meetings, no formal papers were presented. The conference is devoted to informal discussion of certain central themes with one member acting as moderator or chairman. The following was the 1958 program.

1. Insects attacking man and animals. D. E. Howell, *Chairman*
2. New developments with insecticides. E. H. Macomber, *Chairman*
3. Systematics and insect populations. D. G. Denning, *Chairman*
4. Field crop insects. J. T. Medler, *Chairman*
5. Stored products insects. D. A. Wilbur, *Chairman*
6. Forest and range entomology. J. A. Beal, *Chairman*
7. Agricultural curriculum and the teaching of entomology. H. Knutson, *Chairman*
8. Business, R. C. Dobson, *Chairman*

There were planned programs for the families during the day with a 4-H craft leader being in charge. Each evening was devoted to family activities such as movies, stunts, group singing, square dancing, etc. One day of the conference was set aside for collecting insects, hiking, fishing or just enjoying the view.

Officers for 1958 were R. C. Dobson, *Chairman*; Herbert Knutson, *Vice Chairman*; W. Don Fronk, *Secretary* and J. L. Hoerner, *Treasurer*.

Officers for 1959 will be Herbert Knutson, *Chairman*; Frank Randall, *Vice Chairman*; W. Don Fronk, *Secretary*, and J. L. *Hoerner*, Treasurer. The conference in 1959 will again be held at Cameron Pass sometime in August. Information on the Conference may be obtained by writing W. Don Fronk, Department of Entomology and Parasitology, University of Wyoming, Laramie, Wyoming.

HOW INTERNATIONAL IS ESA?

By M. D. LEONARD

Even a fairly casual inspection of the latest Membership List of the Entomological Society of America (BULLETIN OF THE ENT. SOC. AMER. 3(4): 7–57) reveals that it contains a considerable number of foreign names and addresses. In order to determine just how "international" our Society is, a count has been made with the following results:

About 230 members have addresses outside of the United States and Canada. Of these, however, about 50 are United States citizens on foreign assignment. The Society therefore has about 180 foreign members.

Although these foreign members constitute slightly less than 5% of the total estimated membership of 4200, the Society has a truly international flavor when it is realized that these members are located in 48 countries and political entities. The membership in 10 leading countries is as follows: India and Mexico, 19 each; Philippines, 14; Japan 10; Peru, 9; Brazil, Egypt, and Italy, 7 each; England and Formosa, 6 each.

1958 AAAS-CAMPBELL AWARD

The AAAS-Campbell Award for Vegetable Research, the highest of the AAAS prizes awarded during the Annual Meetings of the American Association for the Advancement of Science on December 30th in Washington, D. C., was given to Dr. Karl Maramorosch of the Rockefeller Institute for Medical Research, New York. The presentation of the award established last year by the Campbell Soup Company, was made by Louis P. Reitz, USDA, Beltsville, Md., chairman of the award committee. The AAAS-Campbell Award consists of $1,500 and a bronze medal, given for "an outstanding single research contribution, of either fundamental or practical significance, relative to the production of vegetables . . ." The specific published paper on which the 1958 award was based was entitled "Cross protection between two strains of corn stunt virus in an insect vector" that appeared last October in *Virology*. The research brought together work with plants, the virus and the insect that transmits the virus from one plant to another. Chosen from among 8 nominations submitted for consideration by the award committee, this was the only one that included entomological research.

The winner, Dr. Maramorosch, a member of the Entomological Society of America and vice-chairman of Section C, subsection c, was born in Vienna, Austria, in 1915. He became a naturalized United States citizen in 1952. His academic training includes a Master of Science degree (1938) from the University of Warsaw, where he majored in Entomology, and a Ph.D. degree (1949) from Columbia University. At present he holds a position on the faculty of the Rockefeller Institute, a graduate university and research center in New York City. Dr. Maramorosch served as visiting professor to the University of Wageningen, Netherlands (1953) and Cornell University (1957). He holds membership in a number of professional and honor societies. His studies contributed basic information to a better understanding of the virus diseases of vegetable, fruit, other food, and ornamental plants and of the part insect carriers play in the multiplication of the virus and its dissemination. These are fundamental discoveries of value in developing disease control measures and in indexing disease-free seed or plant stocks. They may also shed light on those human virus diseases that are insect transmitted. Congratulations are extended.

Members of our Society are urged to submit nominations for outstanding research contributions that may be eligible for this annual award. G. J. Haeussler, Entomology Research Division, Beltsville, Md., continues to represent the Society on the AAAS-Campbell Award Committee. Details for submitting nominations for the 1959 award will be published in a subsequent issue of the BULLETIN.

U. S. D. A. AWARDS

Dr. Clarence H. Hoffmann, U. S. Department of Agriculture entomologist, has been presented with a Certificate of Merit and a cash award of $300 for his "exemplary record of performance". The award recognized the value of Dr. Hoffmann's technical research advice in connection with Federal-State program efforts to control two serious forest insects, the gypsy moth and the spruce budworm.

Dr. Hoffmann is assistant director of the Entomology Research Division of USDA's Agricultural Research Service at Beltsville, Md. He was advised of the award by Dr. Byron T. Shaw, ARS administrator, and was presented with the certificate and check by Dr. Edward F. Knipling, director of the Division.

The award was also presented for his efforts in organizing an extensive Federal-State study on the effects of the insecticide DDT on fish and fish-food organisms. The insecticide is used as an aerial spray in attempts to eradicate the gypsy moth in areas of several Eastern States, and to control the destructive spruce budworm in certain areas of Montana and Maine.

In addition, the award recognized the far-reaching significance of his basic knowledge and efforts in showing the overall benefits gained from the chemical control of insect pests, especially in relation to forest insect control problems.

Samuel I. Gertler, U. S. Department of Agriculture chemist at Beltsville, Md., has also received an award of $300 and a certificate of merit. His award was for outstanding research and exceptional productiveness in the development of chemicals to control insects.

Mr. Gertler also received congratulatory letters from Dr. Byron T. Shaw, administrator of USDA's Agricultural Research Service, and Dr. Edward F. Knipling, director of the Entomology Research Division of ARS. Recommendations for the award were made by Dr. Knipling and Mr. Stanley A. Hall. Mr. Hall heads pesticide chemicals research at Beltsville, where Mr. Gertler conducts investigations.

Notable among Mr. Gertler's several accomplishments leading to the award was the synthesis in 1956 of a highly effective attractant for the Mediterranean fruit fly, which then threatened Florida's citrus industry. The synthetic attractant, making it possible to locate infestations and thus aid in eradication of the insect, came just as world supplies of a costly natural attractant were exhausted.

THE CROSSROADS PHILOSOPHER[1]

I read the other day where for four billion dollars scientists can establish a man-made satellite thousands of miles out in space. It seems to me that these smart boys are scatterin' their fire. They're movin' on to new jobs before they finish the old ones.

Take the house fly, for example. He is one of the worst afflictions man has, but as far as I can tell there ain't one fly less today than there was before the atom was split. Like it is now, science is just halfhearted about some of our problems. It perfects a sure death for flies and everybody buys a spray gun and it works for a while. Then the flies catch on and develop an immunity to it. With radar, interceptor planes, radioactive waves, etc. to throw against a human invader, all we've really got to combat the fly is fly paper, the fly swatter and screen wire.

I would like to see Congress appoint a commission to draw up a list of common everyday pests which ought to be eliminated before we let 'em use any more of our tax money on nuclear energy, interplanetary travel and the like. Just draw up the list, hand it to the scientists and tell 'em they can't play with atoms any more until they clean up the loose ends. What could be more ridiculous than a man about to fire a rocketful of scientists out into space havin' to stop and scratch a chigger bite?

[1] Country Gentleman, p. 99, July, 1953.

Undergraduate Training in Entomology and Other Sciences for Insect Ecology

By Ray F. Smith

University of California, Berkeley

Ecology is the scientific study of the interrelationships of plants and animals in and to their complete environment under natural conditions. It is an integrating field drawing together the facts and principles of many other sciences. The ecologist must have an understanding of these other sciences as well as his own (Chapman, 1955). He must be acquainted with the great variety of plants and animals that live in the areas he studies. He must know their behavior, habits and peculiarities as well as their names. This requires a sound background in morphology, physiology and psychology. The variation in these characteristics and its basis in genetics and evolution must also be kept in mind in any ecological studies. To avoid the errors of the past and to maintain the scientific stature of his field, the ecologist must also be a good experimentalist and a sound statistician.

Lee R. Dice (1952, p. 13) has described the background of the well-trained ecologist as follows "[He] must have extensive and intensive training in many branches of biology. He must also be able to describe and to measure the environments of the species and the communities that he studies. To this end he must have training in geography, geology, meteorology, climatology and soil science. These subjects demand a broad background training in physics and chemistry.

"A fully trained ecologist, accordingly, has to be well trained in practically all the major branches of science. Even astronomy and anthropology cannot be neglected, for they may help to explain fluctuations in certain populations and to clarify the past history of certain communities. Furthermore, because the results of scientific studies are published in many languages, the ecologist must be a linguist. He should be able to read with fair facility English, German, French, and Russian. A knowledge of Spanish and of several other languages will often be helpful."

It is then obvious that our recent graduates are not adequately trained in other sciences. It is also questionable if one man can acquire or retain all this information. At one time one man could comprehend many sciences. Leonardo da Vinci made significant contributions to anatomy, medicine, geology, and engineering. Over the centuries man's factual knowledge has increased to the place where such feats are no longer possible. The pace continues to accelerate. With this point in mind Chancellor Stanley B. Freeborn (1956) recently said:

"I doubt very seriously if there is an entomologist alive today, no matter how renowned, that has at his command as large a percentage of the known knowledge of entomology as the average B.S. graduate in entomology of my vintage forty plus years ago."

That is undoubtedly true and it will also be true of today's graduate talking forty years from today in 1998 at the 46th annual meeting of the Entomological Society of America.

My point is that we should not judge a graduate by the percentage of the known facts he has acquired. A four year curriculum at the university level is no more than an important step in a man's lifetime of education and training. It should not be a terminus but a starting point. It should be an introduction that whets his appetite for more.

As stated previously, new facts, new ideas, new techniques are steadily added to the mass of knowledge. Time and the capacity of students are limited. Therefore we are forced continually to make decisions as to what to include in a course or curriculum and what to omit. We just can't keep adding courses to the programs to meet a variety of new needs. The numbers and kinds of courses must be balanced by consideration of the entire educational program.

If we cannot give the undergraduate student everything, then what should our aims be? What should we expect of the new graduate? I think these are the things we should look for in the young graduate to judge if he is adequately trained (cf., Williams, 1951)

1. He should have scientific and intellectual curiosity—a spirit of inquiry. The undergraduate curriculum should foster this, not dull it. He should have awareness, understanding, and appreciation of the intellectual achievement of mankind.
2. He should have a broad training in the basic principles of science. He should understand the importance of and appreciate the rigors of the experimental method.
3. He should have acquired a certain body of principles, facts and techniques from the sciences basic to his field. It is important that he learn some things well and not cover too much in too superficial a manner. We should avoid training experts in the passing of examinations—mere regurgitators.
4. The student should know how his "islands of knowledge" relate to one another and how he can fill in the gaps. He should have the sources of this information so that at a later time he may refresh himself or obtain more detail.
5. He should be able to communicate with his fellow man. To this end he should have a reasonable degree of proficiency in English and at least one foreign language.

In this discussion, I have not provided a list of outside courses every entomology student should have and I shall not. Such lists of requirements are minimum lists which set the floor below which we should not drop.

Students differ from one another in many ways and educational programs must take these differences into account. Our students differ widely in social, economic and educational backgrounds and interests. They have diverse goals.

A few students seem to know exactly where they are going—most do not. If we knew exactly what each student would be doing 15 years from now perhaps we could meet some of the deficiencies in our current programs. Hence, in each case we must provide for several possibilities.

Another difficulty in precisely describing the content of a curriculum on the basis of a list of courses, is the variation in course content. Even at the same institution what is covered in Biology 23, to use an anonymous designation, will not be the same from year to year or even in the different sections in any one year. This is not necessarily bad since a good instructor should be continually revising and improving his courses.

This brings up the importance of the quality of instruction in defining an adequate training. The good instructor must not only know his subject matter well, but he must have the skill to present his material effectively and to stimulate his students.

A final reason as to why I am opposed to rigid curricula is that they sometimes hamper the superior student. By the superior student, I do not mean the straight A student; I mean the student who, in the long run of his life, will be superior. Poor grades may simply be a reflection of a dull program or of an impersonal system. Where superior students can be identified, the curricula and course requirements should be sufficiently flexible to permit a program of study that will arouse their interests and reveal their real capabilities.

In our concern, for the training of entomologists for specific jobs, let us not forget the education of the man

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for life itself. The bachelor's degree should serve as the basis for later applied or professional work without sacrificing the liberal education.

In conclusion and in answer to the question before this panel, I feel that allowing for the inherent differences between students, the broader needs of education, and the time available, most graduates in entomology are adequately trained in the other sciences. The training in other sciences of the well-prepared graduate in entomology is also an adequate and sound basis on which he can build for a future in insect ecology.

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The Practice of Entomology

By CHARLES G. LINCOLN[1]

THE practice of plumbing and the practice of medicine have much in common—new Cadillacs—performance of services by trained persons who are members of the union in good standing. Amateurs are discouraged from trying to install plumbing or from trying to remove appendixes.

Entomology differs. It is a do-it-yourself profession. There are exceptions—termite and household pest control—much public health work—eradication programs. Largely, though, we try to teach the customer or patient how he can control his insect pests.

As a specific example, each state has one or more extension entomologists who make recommendations for insect control. They work with county agents who in turn transmit the recommendations to the farmer. The actual operation of insect control by farmers is thus two steps removed from the entomologist.

How many times have entomologists said, "The farmer is an ignoramus—the farmer won't make insect counts—the farmer won't mix it right or put it out right—you can't make an entomologist out of the farmer." If these statements are true, we should refuse any longer to be a do-it-yourself profession.

If these statements are true, in all honesty we owe it to the general public and to ourselves to say, "The general public, the average farmer, the man on the street is making a mess out of insect control. Entomologists must become practitioners, not advisers or educators. Entomological research is doing fine, but it is not being applied effectively."

If these statements are *not* true, we should quit making them. We should say, "The farmer is capable of making the necessary observations, drawing logical conclusions, of mixing and applying insecticides correctly—provided the entomologist does his job."

I wish to defend this latter proposition. For the most part, the profession of entomology should advise and assist people with insect control problems. We should not become practitioners.

Here are some examples to support my stand. Arkansas farmers scout their cotton for boll weevil and other insects. Most of them learned to do it in scouting schools conducted by county agents. A scouting school is a meeting of eight to twelve farmers in a field of cotton. The county agent demonstrates how to make infestation counts—then the farmers practice making counts, then they move to the shade to talk about what to do.

In 1949 Paul Boyer, Jefferson County Agent, and his assistant, Cecil Cox, held 33 scouting schools with 310 farmers in attendance and 65 other farmers were individually trained. I believe this is the course record, although it has been closely approached several times.

Progress was slow at first; but, over the years farmers have improved their scouting techniques, their understanding of control recommendations, and their judgment in applying recommendations. This is only one example of farmers doing an effective job of insect control.

Most of you have heard of our cotton insect scouts in Arkansas. The first scout was placed in 1925 and others intermittently in later years. Two were placed in 1949, ten in 1950. Growth continued until there were 69 scouts in 1958. Each scout handles an average of 1200–1500 acres. He scouts it weekly. He reports to the farmer, the county agent, and the extension entomologist. He carries the official title, assistant to the county agent, but is paid by the farmer. His job is to make insect counts and report them accurately. He makes recommendations only on request. The farmer assumes the responsibility for deciding what to do. The farmer accepts a recommendation from the scout at his own risk. This is the way he likes it. Arkansas farmers don't want to turn over the job of insect control to someone else and forget about it.

Although the paid scouts attract the attention in Arkansas, they are not the most important part of the program. They only scout about 10% of the state's acreage. About 90% of the cotton acreage in Arkansas is scouted and most of this is well scouted. In other words, farmers themselves are scouting 80% of the acreage and doing a creditable job.

There are ever-increasing opportunities for entomologists in agriculture production and processing. For example, recently Robert Kendrick received a M.S. degree in Entomology at the University of Arkansas. On February 2, 1959 he started to work for the Steele Canning Company of Springdale, Arkansas. This is a new position. Bob is not the first field man for a processor with the responsibility for insect control, but he is the first *entomologist* in such a position in Arkansas. What relationship should he assume with his employers and with the farmer-producers? It is my firm conviction that he should advise, educate, and lead but he should not dictate the practices the farmer must follow nor should he and a corps of assistants try to make the necessary insecticide applications.

These examples have been chosen because of personal familiarity with them. They are not necessarily unique.

Public relations is receiving a lot of deserved attention. Public relations often has the limited goal of creating in the general public a favorable attitude toward entomology and entomologists.

Professional standards is being talked a lot, usually in very general terms. I suggest that Dr. Merkl be instructed to purchase with Branch funds an eleven-foot pole for the use of those who won't touch this subject with a ten-foot pole.

Public relations and professional standards have application only after the profession of entomology knows where it is going.

Entomology is rapidly becoming recognized by the general public. Insect control is of increasing importance in our economy. There are more and more entomologists in closer and closer contact with the public. The profession must accept increasing responsibilities. We cannot do this unless we know what we want to do.

The question raised here is basic to the profession of entomology. Does our future course lie as practicing entomologists who render insect control as a service, or does it lie in furnishing advice, assistance and leadership to laymen who make the final decisions and carry out the actual practices? I wish to take a firm stand for the latter course. It calls for leadership of a high order. This leadership must come from within the profession of entomology, not from deans, directors, and other administrators. We should not shirk the responsibility.

[1] Chairman's address, Cotton States Branch, ESA, Feb. 2, 1959, Memphis, Tenn.

BOOK REVIEWS

GUIDE TO THE LITERATURE OF ZOOLOGICAL SCIENCES. By Roger C. Smith. Burgess Publishing Co., Minneapolis, Minn. ed. 5, 1958. 214 pp. $3.50.

The following is taken from the preface to this edition.

In this new, fifth edition considerable effort has been made to add new helps, remove some references to publications which are less useful now, to profit by every suggestion that has reached the author from those who have used the guide, and otherwise get this text in the best form possible. Blank pages have been added at the ends of chapters for notes by the user.

This book is not a bibliography nor is it a complete list of references on any subject. It deals with the literature problems of the biologist in particular and endeavors to mention the more important, more useful and the more recent helps and types of literature under suitable chapter and sectional headings.

It is intended to impress students and others engaged in research that it is necessary to find out early what others have done on their problems and for scientists generally to make an effort to keep up-to-date in their fields of knowledge. This guide should help to make this task a little easier and a little less time consuming.

F. W. Poos

INSECT MIGRATION, by C. B. Williams. xiii + 235 pages. The Macmillan Company, 60 Fifth Avenue, New York 11, N. Y. $6.00.

This is an intriguing book, beautifully written for easy and pleasurable reading, and supported by excellent illustrations consisting of eight plates of photographs in color and 16 in black and white as well as numerous maps and diagrams. The author, who has been occupied with the study of insect migration over a period of more than 40 years, is widely recognized as the world's foremost authority on the subject. In this work he has summarized a great mass of information accumulated during personal studies made in all parts of the world, and has fitted these observations in entertaining fashion aroun d earlier and contemporary contributions in the field. In short, the book is a masterful review of all that is known about insect migration.

After explaining his use of the term migration as "continued movement in a more or less definite direction, with both movement and direction under the control of the animal concerned," and giving a brief history of the study of the phenomenon, Dr. Williams offers accumulated evidence of migration, with numerous specific examples involving butterflies and moths, locusts, dragonflies, ladybird beetles, certain wasps, hover flies, leafhoppers and others. Following this section are several chapters dealing with theories that have been put forward to explain migration and with tne problems presented by these theories. In this connection the author discusses the general characteristics of the migratory flights; orientation and maintenance of flight direction, in which the possible influence of various factors such as wind, light, temperature, humidity, ground contours and scent are considered; return flights; the periodic rarity and abundance of the migratory species, and their wide geographical distribution in which the normal zoogeographical regions are overlapped. Other problems dealt with are the effects of migration on the relation of the migratory species to its natural enemies; the wide range in observed sex ratios among migrating forms in flight; the state of sex development at which migration can occur; the energy required for long, uninterrupted flights; and the survival of adverse conditions obtaining during migration. In rounding out this treatment of insect migration the author discusses briefly the methods followed in doing the work and in studying the assembled information; and finally, he gives a bibliography of the more significant publications on insect migration.

This is an entertaining book; and it is also one that will long serve as a useful reference work on a fascinating and more or less controversial subject. It deserves a place on the shelf of every entomologist.

C. F. W. MUESEBECK

COLLECTING, PRESERVING, AND STUDYING INSECTS. By Harold Oldroyd. The MacMillan Company, New York. Printed in Great Britain. 135 figs. + 1 map. 327 pp. 1958. $5.00.

This book contains an account of the equipment and methods used in making a collection of insects. It is written in terms that will be clear to the beginner, yet detailed enough to serve as a reference text. Amateur and professional entomologists should work in the closest harmony and it is essential that the amateur should not be deterred from making known his observations by lack of knowledge of how to go about it. It is part of the purpose of this book to point out errors to be avoided, as well as to indicate all that should be done by a serious collector.

Four chapters are devoted to the collecting of insects, three chapters to preserving, examining, and photographing them, and five chapters are devoted to how to study them. In Chapter VIII the author gives a brief introduction to the system of zoological classification and nomenclature. The appendices include a list of some useful formulae and reagents, a glossary of entomological terms, a list of selected references, some useful addresses, and an index. Many entomologists will find much information of use to them in this book. It is printed with easy-to-read type and is wellbound for convenient use.

F. W. Poos

CHECK-LIST AND BIBLIOGRAPHY ON THE OCCURANCE OF INSECTS IN BIRDS' NESTS. By Ellis A. Hicks. 681 pages. Iowa State College Press, Ames. $8.50.

This book is devoted to types of insects listed as being found in the nests of birds in the past 150 years. Over 2000 entries cover 18 orders of insects and 26 orders of birds. The author selected an alphabetical arrangement as being most practical for both the entomological and ornithological lists. Each list begins with the ordinal names of each of the two classes and includes all subsequent taxa.

Useful to workers in entomology, ornithology, agriculture, medicine, public health, as well as other branches of natural science, it consolidates and organizes definitive information on the specific habitats for particular species of insects—how they live in relation to each other and to the birds which provide them an agreeable environment. Researchers formerly had to go to many sources to find this information.

Birds' nests commonly constitute ecological entities, or more accurately, a succession of entities. They may, either before or after being occupied by birds, be reservoirs for insects capable of transmitting pathogens to man or of irritating man and other animals.

Translation of "HISTOIRE D'UN INSECTE QUI DEVORE LES GRAINS DE L'ANGOUMOIS; AVEC LES MOYENS QUE L'ON PUET EMPLOYER FOUR LE DETRUIRE," by H. L. Duhamel du Monceau and M. Tillet. 314 pp., 3 pl. Paris, 1762.

The first extensive insect-control investigation of the modern type is reported in this book. All of the details are there and they are all interesting. The illustrations are good. Considering the absence of earlier examples of such publications, it may be said that Duhamel du Monceau

and Tillet produced a masterpiece. However, as in the case of the pioneering research of Gregor Mendel, the work of these men was forgotten. Even Professor E. O. Essig in his 1,029-page *A History of Entomology* makes no mention of them. In the opinion of the reviewer they should be regarded as the founders of economic entomology.

In the spring of 1760 when Olivier, who gave the Angoumois grain moth its scientific name, was 4 years old, Henri Louis Duhamel du Monceau and his assistant Mathieu Tillet went to Western France to investigate the life history and control of a stored-grain insect that had flared up to outbreak destructiveness. They talked with numerous farmers, established the limits of the infestation, set up a laboratory in a room in the Chateau de Larochefoucauld (which is still there), made a thorough study of control measures with the help of cooperating wheat growers, and wrote their report. They discussed among other things the biological heating of infested grain when stored in bulk; activities of swallows that fed upon the moths; infestation in ripening wheat, especially in the vicinity of infested stored wheat; results of sowing infested seed wheat; ability of the adults to escape from planted grain; effects of weather on moth abundance; the degree of infestation found in wheat; parasitism of the larvae; benefits to be derived from cool storage; and methods of heating infested wheat in kilns. They decided that sulfur fumigation was not wholly effective. Prompt threshing and bulk storage were urged.

The ribbon copy of the translation, including photographs of the illustrations and title page, is on file in the Library of the U. S. Department of Agriculture.

PEREZ SIMMONS

The translation referred to above was made in 1925 by Elisabeth Demet Simmons, now deceased. She was the wife of Perez Simmons. Comment on this book and on the translation was published in the JOURNAL OF ECONOMIC ENTOMOLOGY, Volume 22, No. 5, October 1929, by Mr. Simmons.

We are indebted to our old friend "Pete" for bringing all this to our attention. We should like to further acknowledge with the thanks of the officers and members of the Society the presentation of an original edition of this rare book to the Society by Mr. Simmons

R. H. NELSON

PLANTS OF WOODLAND AND WAYSIDE, by SuZan Noguchi Swain, 1958. 57 pp. illus. Garden City Books, Garden City, N. Y. $2.95.

We had the pleasure of writing a short review of INSECTS IN THEIR WORLD written and illustrated by Mrs. Swain in 1955. This review appeared in the March 1956 BULLETIN. The present book, written and illustrated by the same author, is a companion piece to the one on insects and is of the same high scholastic and artistic quality. It is intended for young readers, as was the previous book and like that one, would be of interest to amateur naturalists of any age.

The following are example section headings which show something of the content of the book.

The Wonderful World of Plants
The Study of Plants is Botany
Parts of Plants and Their Functions
Flowering Plants of the Woodland
The Case of the Yucca and its Moth

This reviewer has no status as a botanist but has had a life long interest. This book impresses him with its uncomplicated but correct approach to botanical nomenclature. Possibly in the final analysis, however, the thing that will be most noted about the book are the colored illustrations, one or more of which are found on every page. These are beautifully done. It would seem that this book, as well as INSECTS IN THEIR WORLD, would be excellent text books for Junior High School biology courses.

R. H. NELSON

NEW PUBLICATIONS

1958 GRASSLAND PROCEEDINGS. Annual Program of the American Grassland Council, North Carolina State College, Raleigh, North Carolina June 18–19, 1958. This grassland symposium was sponsored jointly with the American Dairy Science Association. 153 pages [Processed]. The Entomological Society of America is one of 21 cooperating member organizations of the American Grassland Council (Formerly Joint Committee on Grassland Farming)

A CENTURY OF BIOLOGICAL RESEARCH IN ILLINOIS, 1858–1958. By Harlow B. Mills, George C. Decker, Herbert H. Ross and six other authors (not entomologists). Illinois Natural History Survey Bulletin Vol. 27, Art. 2, 234 pp., December 1958. A most interesting record of 100 years of the scientific progress of the Illinois State Natural History Survey.

A BIBLIOGRAPHY OF BRITISH LEPIDOPTERA 1608–1799, by Arthur A. Lisney. 320 pages with frontispiece and 39 illustrations, including portraits, in monochrome cellotype. Five hundred copies, bound in fine buckram, will be on sale in mid-1959. The Chiswick Press, London, 1959. $30.00 post free.

GUIDE TO THE CHEMICALS USED IN CROP PROTECTION, Third Edition, Supplement 1. By Hubert Martin, Science Service Laboratory, University of Western Ontario Sub Post Office, London, Ontario. 52 pp. + index 7 pp. July 1, 1958.

DISEASES OF FOREIGN FOREST TREES GROWING IN THE UNITED STATES (An Annotated List). By Perley Spaulding, formerly forest pathologist, Northeastern Forest Experiment Station, Forest Service, U. S. D. A. Agricultural Handbook No. 139, U. S. Dept. of Agriculture October, 1958. For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price 40 cents.

UNIVERSITY OF KANSAS SCIENCE BULLETIN—Vol. XXXIX pp. 1–525. November 18, 1958. Editor for this volume, George W. Byers. Devoted to the publication of the results of research by members of the University of Kansas. This volume contains 13 numbers, eight of which are devoted to entomological subject matter.

UNITED STATES GOVERNMENT PRINTING OFFICE STYLE MANUAL ISSUED BY THE PUBLIC PRINTER. viii + 496 pp. Revised Edition, January 1959. For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price $2.75 Buckram; abridged, $1.25.

The use of this manual is recommended in the preparation of manuscripts intended for publication by the Entomological Society of America.

FORESTRY TERMINOLOGY—A GLOSSARY OF TECHNICAL TERMS USED IN FORESTRY. Third Edition. Edited by Arthur B. Meyer and F. H. Eyre. v + 97 pp. 7½″ x 10″. Published by Society of American Foresters, Mills Building, Washington 6, D. C. January, 1958. Price postpaid, $3.50.

SUGGESTIONS FOR HIGH SCHOOL INSECT RESEARCH PROJECTS, by J. J. Davis. Turtox News 35(8) 162–168, August 1957.